State of California
California Environmental Protection Agency
AIR RESOURCES BOARD

APPENDICES

FOR THE

Report for the Application
and Ambient Air
Monitoring for Benomyl

Engineering and Certification Branch
Monitoring and Laboratory Division

Project No. C99-108 (Benomyl Application and Ambient)

Date: April 2, 2002

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SAMPLING PROTOCOL

Air Resources Board

Alan C. Lloyd, Ph.D.
Chairman

Winston H. Hickox
Agency Secretary

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Gray Davis
Governor

MEMORANDUM

TO: John Sanders, Chief
Environmental Monitoring and Pest Management Branch
Department of Pesticide Regulation

FROM: George Lew, Chief
Engineering and Laboratory Branch
Monitoring and Laboratory Division

DATE: February 8, 2000

SUBJECT: FINAL PROTOCOL FOR THE 2000 BENOMYL AIR MONITORING IN MERCED/MADERA/FRESNO COUNTIES

Attached is the final "Protocol for the Application and Ambient Air Monitoring of Benomyl in Merced/Madera/Fresno Counties During Winter, 2000." We apologize for not sending the protocol in draft form for your review at an earlier date. The development of sampling and analytical methods took a little longer than expected and so the procedures and validation results were not available until recently. The ambient monitoring was started on January 31, 2000. We expect to conduct the application monitoring later in February or March.

If you or your staff have questions or need further information, please contact me at (916) 327-0900, Kevin Mongar at (916) 323-1169, or Oscar Lopez at (916) 323-1161.

Attachment

cc: Ray Menebroker, SSD
Pam Wales, DPR (w/Attachment)
Jerry Prieto, Fresno Co. Agricultural Commissioner (w/Attachment)
Michael J. Tanner, Merced Co. Agricultural Commissioner (w/Attachment)
Robert Rolan, Madera Co. Agricultural Commissioner (w/Attachment)
David L. Crow, SJVUAPCD (w/Attachment)

California Environmental Protection Agency

⊖≣ Air Resources Board

Protocol for the Application and Ambient
Air Monitoring of Benomyl
In Merced/Madera/Fresno Counties During Winter, 2000

Engineering and Laboratory Branch
Monitoring and Laboratory Division

Project No.
C99-108 Ambient/Application

Date: February 4, 2000

APPROVED:

[signature]

Oscar R. Lopéz, Project Engineer

[signature]

Dave Todd, Acting Manager
Testing Section

[signature]

George Lew, Chief
Engineering and Laboratory Branch

Protocol for the Application and Ambient
Air Monitoring of Benomyl
In Merced/Madera/Fresno Counties During Winter, 2000

I. Introduction

At the request (November 1, 1999 Memorandum, Helliker to Lloyd and November 23, 1999 Memorandum, Segawa to Castronovo) of the California Department of Pesticide Regulation (DPR), the Air Resources Board (ARB) staff will determine airborne concentrations of benomyl and it's breakdown products carbendazim and n-butyl isocyanate in Merced/Madera/Fresno Counties over a six week ambient monitoring program and over a three day application monitoring program. This monitoring will be done to fulfill the requirements of AB 1807/3219 (Food and Agricultural Code, Division 7, Chapter 3, Article 1.5, Section 14022(c)) which requires the ARB "to document the level of airborne emissions.... of pesticides which may be determined to pose a present or potential hazard..." when requested by the DPR. Monitoring is being conducted to coincide with the use of benomyl as a selective fungicide on almonds, grapes and stonefruits.

The sampling and analysis for benomyl will follow the procedures and quality assurance guidelines described in the "Quality Assurance Plan for Pesticide Air Monitoring" (May 11, 1999 version) which is included as Appendix A.

The draft method development results and "Standard Operating Procedures for the Analysis of Benomyl in Ambient Air" and the "Standard Operating Procedures for the Analysis of n-butyl isocyanate in Ambient Air" are included as Appendix B.

II. Chemical Properties of Benomyl

The following information on the physical/chemical properties of benomyl (Methyl 1-butylcarbamoyl-2-benzimidazolecarbamate) was obtained from the November 23, 1999 memorandum "Recommendation for Benomyl Monitoring for the Toxic Air Contaminant Program."

Pure benomyl (CAS: 17804-35-2) exists as colorless or white crystals with faint acrid odor. Benomyl has a molecular formula of $C_{14}H_{18}N_4O_3$ and a molecular weight of 290.3 g/mole. It has a water solubility of 2.8 mg/L at 25 $^\circ$C (stable only at pH7), a Henry's Constant of 5.1 x 10^{-9} atm·m^3/mol at 25 $^\circ$C, and a vapor pressure of approximately 3.73 x 10^{-8} mmHg at 25 $^\circ$C.

In the environment, benomyl (figure 1a) decomposes by loss of the butylcarbamoyl group to form the relatively stable, strongly fungicidal methyl 2-benzimidazolecarbamate, also known as carbendazim (figure 1b) (Tomlin, 1994). In soil and water, benomyl rapidly converts to carbendazim and 2-aminobenzimidazole

(Montgomery, 1997). Benomyl residues are relatively immobile in organic soils, and were detected only in the top four inches. At least two strains of fungi and four strains of bacteria demonstrated the ability to degrade benomyl to nonfungicidal compounds in loamy soils (Helweg, 1972).

(a) Benomyl   (b) Carbendazim

$$O{=}C{=}N{-}C_4H_9$$

(c) Butyl isocyanate

Figure 1: The Chemical Structures of Benomyl, Carbendazim and n-Butyl Isocyanate

In laboratory studies under greenhouse conditions with temperatures ranging from 25°C to 40°C, benomyl decomposed to equimolar amounts of carbendazim and butyl isocyanate (BIC) (figure 1c) when mixed with water and introduced over a layer of basaltic gravel growing medium (Tang et al., 1993; Tang et al., 1992). BIC readily volatilized and was detected in the vapor phase, regardless of formulation. As temperature increased, the rate of BIC formation was enhanced in the early hours following application, especially when the dry flowable formulation was used (Tang, 1993). In a greenhouse study, BIC was detected in air samples collected from sealed glass dishes containing aqueous benomyl suspensions (Aragaki et al., 1994). Airborne concentrations of BIC would likely be lower under field conditions because of the dilution of open air (Tang, 1993).

Benomyl has an LC_{50} (96 hour) of 0.17 mg/L for rainbow trout, and 4.2 mg/L for goldfish. It is nontoxic to bees, with an oral and contact $LD_{50} > 10$ μg/bee (Tomlin, 1994).

III. Sampling

Samples will be collected by passing a measured volume of ambient air through two XAD-2 resin tubes that are mounted on a sampling tree as shown in Figure 2. One tube is used to collect benomyl and carbendazim and the other to collect n-butyl isocyanate. The exposed XAD-2 resin tubes (SKC #226-30-06) are stored in an ice chest (on dry ice) or in a freezer until desorbed with organic solvent. The sampling flow rates of 2.5 liters per minute (Lpm) for benomyl/carbendazim and 30 cubic centimeters per minute (cc/min)[1] for BIC will be accurately measured and the sampling system operated continuously for 24 hours with the exact operating interval recorded in the logbook. The tubes will be protected from direct sunlight and supported about 1.5 meters above the ground during application monitoring sampling periods and 1.5 meters above rooftops for the ambient monitoring. At the end of each sampling period, the tubes will be placed in culture tubes with an identification label affixed. Subsequent to sampling, the sample tubes will be transported on dry ice, as soon as reasonably possible, to the ARB Sacramento Monitoring and Laboratory Division laboratory for analysis. The samples will be stored in the freezer or extracted/analyzed immediately.

A rotameter is used to control sample flow rates and two will be used per sampling tree. One rotameter will have a scale from 0-5 Lpm for benomyl/carbendazim and the other from 0-240 cc/min for BIC. The flow rates are set to 2.5 Lpm and 30 cc/min for benomyl/carbendazim and BIC, respectively, as measured using a digital mass flow meter (MFM) before the start of each sampling period. A MFM scaled from 0-5 Lpm is used for benomyl/carbendazim and a 0-100 cc/min MFM is used for BIC. The flow rate is checked, using the MFM, at the end of each period. Samplers will be leak checked prior to each sampling period with the sampling tubes installed. Any change in the flow rates will be recorded in the field logbook. The field logbook will also be used to record start and stop times, start and stop flow rates, start and stop counter readings, sample identifications and any other significant data.

Ambient Monitoring

The use maps for benomyl suggest that ambient monitoring should occur in Merced, Madera and Fresno Counties during the months of February through mid March. Four sampling sites will be selected in relatively high-population areas or in areas frequented by people. At each site, 24 discrete 24-hour samples will be taken during the sampling period. Background samples will be collected in an urban area distant to benomyl applications. Replicate (collocated) samples will be collected for six dates (each Wednesday) at each sampling location.

The sites selected by ARB personnel would be areas of Merced, Madera and Fresno Counties where farming of almonds and stonefruit is predominant. Sites are selected for their proximity to the fields with considerations for both accessibility and security of the sampling equipment. The towns chosen for sampling are Livingston, Merced,

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1 Flow rate units of cc/min are equivalent to mLpm (milliliters per minute).

Madera, Fresno and Reedley. The sites are near areas of historical use of benomyl. ARB understands that DPR staff will verify and quantify the actual use of benomyl that takes place during the study when the information becomes available. DPR recommends a target 24-hour detection limit of 0.05 $\mu g/m^3$ for benomyl (sum of benomyl and carbendazim) and 8.1 $\mu g/m^3$ for n-butyl isocyanate.

ARB personnel will collect the samples over a six-week period from January 31 through March 10, 2000. 24-hour samples will be taken Monday through Friday (4 samples/week) at the flow rates of 2.5 Lpm and 30 cc/min for benomyl/carbendazim and BIC, respectively.

<u>Application Monitoring</u>

The use pattern for benomyl suggests that application-site monitoring should be conducted during the months of February or March in Merced, Madera, Fresno or Kern Counties, and that the monitoring be associated with applications of benomyl to almonds or grapes. Ideally, monitoring should occur at a site using the highest allowed rates of use (i.e., about 6.0 pounds per acre), however, growers typically apply 1 pound per acre for almonds, and 1-2 pounds per acre for grapes. Rarely do applications exceed 3 pounds per acre. Individual application monitoring schedules will vary based on the type and length of application but will follow the schedule guidelines outlined below in Table 1. Ideally, the monitoring study will include samples taken before, during and for approximately 72 hours following application.

TABLE 1. GUIDELINES FOR APPLICATION SAMPLING SCHEDULE

Sample period begins:	Sample duration time
Background (pre-application)	Minimum of 12 hours
During application	Length of application time
End of application	1 hour (or up to 1 hour before sunset) [1]
1 hour post-application	2 hours (or up to 1 hour before sunset) [1]
3 hour post-application	3 hours (or up to 1 hour before sunset) [1]
6 hour post-application	6 hours (or up to 1 hour before sunset) [1]
1 hour before sunset	Overnight[2] (until 1 hour after sunrise)
1 hour after sunrise	Daytime (until 1 hour before sunset)
1 hour before sunset	Overnight[2] (until 1 hour after sunrise)
1 hour after sunrise	24-hour (until 1 hour after sunrise)

1   These sample duration times will be adjusted depending on length of application and time of sunset.
2   All overnight samples must include the period from one hour before sunset to one hour after sunrise. If the application extends beyond "1 hour before sunset" then the overnight sample will be started at the end of application.

Occasionally, a pesticide application may occur all day long and over the course of two or more days. In these instances samples are collected during the first daily application, followed by a sample from end of application to 1 hour before sunset, followed by an overnight sample ending at either the start of application or 1 hour after sunrise the next morning (same for second or more application days). Following the end of the application, samples are collected according to the above schedule, starting with the 1-hour sample.

A minimum of eight samplers will be positioned, one at approximately the midpoint of each side of the field and one at each corner, if the field is roughly square. If the field shape is rectangular (e.g. long and narrow) then the 8 samplers will be located at regular intervals along the 2 long sides. A ninth sampler will be collocated at one position (downwind). Ideally, samplers should be placed at a minimum of 20 meters from the field. If possible the samplers will be spaced equidistant from the edges of the field. Since benomyl is extensively used in the area, background (before application) samples should collect enough volume to achieve the recommended target 24-hour quantitation limit of 0.05 $\mu g/m^3$ for benomyl, and 8.1 $\mu g/m^3$ for BIC. In all cases though, the minimum background sampling time should be 12 hours.

We will also provide in the monitoring report: 1) An accurate record of the positions of the monitoring equipment with respect to the field, including the exact distance that the sampler is positioned from the field; 2) an accurate drawing of the monitoring site showing the precise location of the meteorological equipment, trees, buildings, etc.; 3) meteorological data collected at a minimum of 15 minute intervals (averages) including wind speed, wind direction, humidity, air temperature, and comments regarding degree of cloud cover; 4) the elevation of each sampling station with respect to the field; and 5) the orientation of the field with respect to North (identified as either true or magnetic north). Samples collected during fog episodes will be designated as such.

IV. Analysis

The method development results and "Standard Operating Procedures for the Sampling and Analysis of Benomyl in Ambient Air" (SOP) are included as Appendix B. The procedures consist of ambient and application samples collected on XAD-2 resin cartridges with a flow rate of 2.5 Lpm. The exposed XAD-2 sorbent tubes are frozen until desorbed with 4 ml of acetonitrile. The injection volume is 100 μL. The reverse phase chromatographic method employs an isocratic mobile phase and a silica/C bonded stationary phase with ultraviolet spectrometric detection at 280 nm. The method detection limit (MDL) and estimated quantitation limit (EQL) for seven replicate spike samples are approximately 7.4 ng/mL and 37 ng/mL respectively. The MDL calculation is: MDL= 3.14(2.35 ng/mL) for n= 7 replicate spikes, and the EQL is: EQL= 5xMDL. The above MDL and EQL are estimates based on results presented in the attached SOP.

The method development results and "Standard Operating Procedures for the Sampling and Analysis of n-butyl isocyanate in Ambient Air" are included as Appendix B. The procedures consist of ambient and application samples collected on XAD-2 resin cartridges with a flow rate of 30 cc/min. The XAD is extracted with dichloromethane (DCM) and placed in a sonicator. The extraction solvent is filtered and the aliquot placed in a vial for analysis. The split injection volume is 1 μL. A gas chromatograph with a capillary column (5% phenylmethylpolysiloxane phase) and a quadrapole mass spectrometer (MS) is used for analysis. The MS detector is operated in selective ion monitoring mode. The method detection limit (MDL) and estimated quantitation limit (EQL) are approximately 0.02 μg per sample and 0.10 μg per sample respectively. The MDL calculation is: MDL= 3.14(s) for n= 7 replicate spikes, and the EQL is: EQL= 5xMDL. The above MDL and EQL are estimates based on results presented in the attached SOP.

VI. Quality Assurance

Field Quality Control for the ambient monitoring will include:

1)   Ten field spikes (same environmental and experimental conditions as those occurring at the time of ambient sampling) at six each for benomyl and four for BIC. The field spikes will be obtained by sampling ambient air at the background monitoring site for 24 hour periods at 2.5 Lpm and 30 cc/min for benomyl/carbendazim and BIC, respectively (i.e., collocated with a background sample). Three sample cartridges will be spiked at 2xEQL and three at 10xEQL for benomyl/carbendazim. Four sample cartridges will be spiked at 2xEQL for BIC.

2)   Ten trip spikes prepared at the same level as the field spikes. Six trip spikes for benomyl and four for BIC.

3)   Ten lab spikes prepared at the same level as the field and trip spikes. Six lab spikes for benomyl and four for BIC.

4)   Replicate samples will be taken for six dates at each sampling location.
5)   A Trip blank will be obtained each week of sampling.

Field Quality Control for the application monitoring will include:

1)   Ten field spikes (same environmental and experimental conditions as those occurring at the time of ambient sampling) at six each for benomyl and four for BIC. The field spikes will be obtained by sampling ambient air at the background monitoring site for 24 hour periods at 2.5 Lpm and 30 cc/min for benomyl/carbendazim and BIC, respectively (i.e., collocated with a background sample). Three sample cartridges will be spiked at 2xEQL and three at 10xEQL for benomyl/carbendazim. Four sample

cartridges will be spiked at 2xEQL for BIC.

2) Ten trip spikes prepared at the same level as the field spikes. Six trip spikes for benomyl and four for BIC.

3) Ten lab spikes prepared at the same level as the field and trip spikes. Six lab spikes for benomyl and four for BIC.

5) A Trip blank will be obtained.

The instrument dependent parameters (reproducibility, linearity and minimum detection limit) will be checked prior to analysis. A chain of custody sheet will accompany all samples. Flow controllers will be calibrated prior to and after sampling in the field.

VII. Personnel

ARB personnel will consist of Kevin Mongar and Oscar Lopez (Project Engineers) and Instrument Technicians from the Testing and Air Monitoring Central Sections of ARB.

Dwyer

LPM
AIR

5
4
3
2
1

ROTAMETER
WITH VALVE
(0-5 Lpm & 0-240 cc/min)

APPROXIMATELY
1.5 METERS

LIGHT COVER

RAIN COVER

TEFLON FITTNG

XAD-2

SAMPLE CARTRIDGE

AC/DC
PUMP
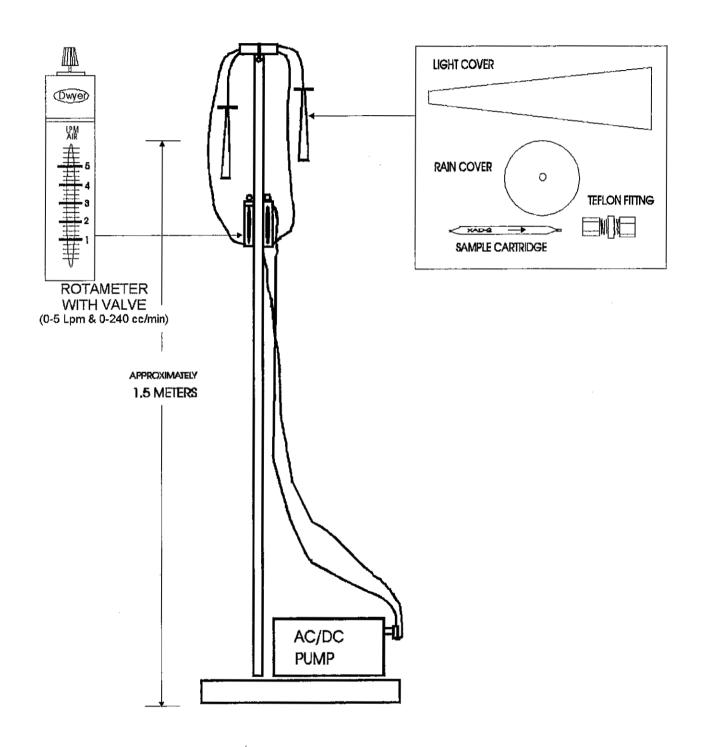
FIGURE 2: SAMPLE TREE WITH TWO ROTAMETERS

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Appendix A

Quality Assurance Plan for Pesticide Air Monitoring

State of California
California Environmental Protection Agency
Air Resources Board

QUALITY ASSURANCE PLAN
FOR PESTICIDE AIR MONITORING

Prepared by the

Monitoring and Laboratory Division
Engineering and Laboratory Branch

Revised: May 11, 1999

APPROVED:

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Kevin Mongar, Project Engineer
Testing Section

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Cynthia L. Castronovo, Manager
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George Lew, Chief
Engineering and Laboratory Branch

This Quality Assurance Plan has been reviewed by the staff of the California Air Resources
Board and approved for publication. Approval does not signify that the contents necessarily
reflect the views and policies of the Air Resources Board, nor does mention of trade names or
commercial products constitute endorsement or recommendation for use.

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QUALITY ASSURANCE PLAN FOR PESTICIDE MONITORING

I.   Introduction

At the request of the Department of Pesticide Regulation (DPR), the Air Resources Board (ARB) staff determines the airborne concentrations of specified pesticides following monitoring recommendations established by the DPR. This air monitoring is conducted to fulfill the requirements of AB 1807/3219 (Food and Agricultural Code, Division 7, Chapter 3, Article 1.5) which requires the ARB "to document the level of airborne emissions .... of pesticides which may be determined to pose a present or potential hazard..." when requested by the DPR. The documentation of airborne concentrations is usually accomplished through two types of monitoring. The first consists of five to eight weeks of **ambient** monitoring in the general area of, and during the season of, peak use of the specified pesticide. The second is monitoring around the perimeter of a field during and for 72 hours after an **application** has occurred. These are referred to as ambient and application monitoring, respectively. To help clarify the differences between these two monitoring programs, ambient and application are highlighted in bold in this document when the information applies specifically to either program. The purpose of this document is to specify quality assurance activities for the sampling and laboratory analysis of the monitored pesticide.

A.   Quality Assurance Policy Statement

It is the policy of the ARB to provide DPR with accurate, relevant and timely air monitoring measurements of airborne pesticide concentrations. The goal of this document is to identify procedures that ensure the implementation of this policy.

B.   Quality Assurance Objectives

Quality assurance objectives for pesticide monitoring are as follows.

(1) to establish the necessary quality control activities relating to site selection, method validation, analytical standard operating procedures (SOP), sample collection, sampling and analysis protocol, data reduction and final reports, and;
(2) to assess data quality in terms of precision, accuracy and completeness, and;
(3) to design air monitoring strategies to meet the pesticide target (estimated) quantitation levels as provided by the DPR.

II.   Air Monitoring

All sampling will be coordinated through communication with the County Agricultural Commissioner's Office. The local Air Quality Management District (AQMD) or Air Pollution Control District (APCD) will be notified prior to any monitoring. Sample collection will be conducted by staff of the Testing Section or staff of the Air Quality Surveillance Branch of the ARB, or an approved ARB contractor.

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A.   Siting

The location and time-frame for **ambient** and **application** monitoring are based on direction provided by the DPR in their "Use Information and Air Monitoring Recommendation for Pesticide Active Ingredient" documents. These recommendations are based on historical trends (normally 2 to 3 years prior) and are submitted to the ARB by the DPR approximately 1 year in advance of intended monitoring. The recommendations direct ARB to monitor for a pesticide in specific counties during specific use periods. Pesticide use maps (historical) and histograms are used along with close coordination with staff of the County Agricultural Commissioner's Office to predict areas (and times) of use for the pesticide for the upcoming use year. Approximately one month prior to the scheduled monitoring DPR will reevaluate the historical use trends using the most recent pesticide use data available.

For selection of **ambient** monitoring sites, ARB staff work through authorized representatives of school districts, private companies or city, county or state government agencies. The probe (sampler) siting criteria for **ambient** pesticide monitoring were obtained from the U.S. EPA "Ambient Air Quality Surveillance" criteria (40 CFR, Part 58) and are listed in TABLE 1. As per the DPR monitoring recommendations, three to five sites are chosen. The monitoring objective in choosing these sites is to estimate population exposure in relatively high-population areas or in areas frequented by people (e.g., schools or school district offices, fire stations, or other public buildings). Sampling sites should be located near (in regions of) specific agricultural crops as recommended by the DPR. One additional site is chosen and designated to be an urban area "background" site which is located away from any expected applications. Information will be collected for each site and reported to DPR regarding; 1) the proximity of the each sampler to treated or potentially treated fields, including the distance and direction, and 2) the distance the sampler is located above the ground. Normally the **ambient** samplers will be located on the roof of a one-story building (e.g., at schools) with the sample cartridge located about 1.5 meters above the roof.

Probe siting criteria for placement of samplers around a pesticide **application** are the same as for **ambient** monitoring tests (TABLE I). A minimum of four samplers are positioned, one on each side of the field. A fifth sampler is collocated at one position, normally the downwind side (based on prevailing breezes). Once monitoring has begun, the sampling stations are not moved, even if the wind direction has changed. Ideally, samplers should be placed at a minimum distance of 20 meters from the perimeter of the field and should be equidistant from the field. *These requirements are nearly impossible to meet because of the physical limitations of most application sites. Twenty meters from a potential application field invariably places the sampler on another landowner's property, in another field where tractors and other equipment must operate, or into another orchard where the siting criteria cannot be met. Fences, canals, roads, ditches, railroad tracks, brush, trees, houses, barns, livestock, parked equipment, uncooperative neighbors, etc. are common obstacles. Monitors are placed as far as possible, up to 20 meters, from the field. Attempts are always made to center the samplers on the face of a side of the field. The sampler is placed to maximize the distance from the field and to avoid obstructions bordering the field. Conditions at the site will dictate the actual placement of monitoring stations.* Information is collected and reported to DPR regarding; 1) an accurate record of the positions of the monitoring equipment with respect to the field, including the exact distance that

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the sampler is positioned from the field; 2) an accurate drawing of the monitoring site showing the precise location of the meteorological equipment, trees buildings and other obstacles; 3) the elevation of each sampling station with respect to the field and the orientation of the field with respect to North (identified as true or magnetic North). Determination of an appropriate site for an **application** test is based on the "recommendations" provided by the DPR. Parameters used to choose the site are:

1. crop type,
2. minimum field area of 10 acres,
3. minimum application rate (as directed by the DPR),
4. type of application (normally no preference by the DPR),
5. availability of sites on all four sides of the field which meet the criteria in Table 1 and can be sited 20 meters from the perimeter of the field (quite often this is not possible, i.e., normally 4 sites are chosen but they may not all meet the criteria), and
6. accessibility and security of the sampling sites/equipment.

Monitoring sites (fields) are arranged through communication with, and the voluntary cooperation of, applicators, growers or owners for **application** monitoring. Normally, representatives of the County Agricultural Commissioner's Office will make initial contact with the applicators/growers or will at least provide a list of possible candidates.

TABLE 1. PESTICIDE PROBE SITING CRITERIA SUMMARY

Height Above Ground (Meters)		2-15
Minimum Distance from Supporting Structure (Meters)	Vertical	1
	Horizontal	1
Other Spacing Criteria		1. Should be 20 meters from trees.
		2. Distance from sampler to obstacle, such as buildings, must be at least twice the height the obstacle protrudes above the sampler.
		3. Must have unrestricted air flow 270° around sampler.
		4. Samplers at a collocated site (duplicate for quality assurance) should be 2-4 meters apart if samplers are high flow, >20 liters per minute.

B. Schedule

Samples for **ambient** pesticide monitoring will generally be collected over 24-hour periods on a schedule of 4 samples per week (Monday through Friday) for 5 to 7 weeks. Occasionally the normal schedule will be interrupted due to holidays and make-up samples may be collected over weekends.

Individual **application** monitoring schedules will vary based on the type and length of application but will follow the schedule guidelines outlined below in TABLE 2. Ideally, the

monitoring study will include samples taken before, during and for approximately 72 hours following application.

TABLE 2. GUIDELINES FOR APPLICATION SAMPLING SCHEDULE

Sample period begins:	Sample duration time
Background (pre-application)	Minimum of 12 hours
During application	Length of application time
End of application	1 hour (or up to 1 hour before sunset) [1]
1 hour post-application	2 hours (or up to 1 hour before sunset) [1]
3 hour post-application	3 hours (or up to 1 hour before sunset) [1]
6 hour post-application	6 hours (or up to 1 hour before sunset) [1]
1 hour before sunset	Overnight[2] (until 1 hour after sunrise)
1 hour after sunrise	Daytime (until 1 hour before sunset)
1 hour before sunset	Overnight (until 1 hour after sunrise)
1 hour after sunrise	24-hour (until 1 hour after sunrise)

1 These sample duration times will be adjusted depending on length of application and time of sunset.
2 All overnight samples must include the period from one hour before sunset to one hour after sunrise. If the application extends beyond "1 hour before sunset" then the overnight sample will be started at the end of application.

Occasionally, a pesticide application may occur all day long and over the course of two or more days. In these instances samples are collected during the first daily application, followed by a sample from end of application to 1 hour before sunset, followed by an overnight sample ending at either the start of application or 1 hour after sunrise the next morning (same for second or more application days). Following the end of the application, samples are collected according to the above schedule, starting with the 1-hour sample.

C.   Meteorological Monitoring

Data on wind speed and direction, barometric pressure, relative humidity and air temperature will be collected during **application** monitoring by use of an on-site meteorological station. The meteorological data will be acquired using a data logger at a minimum of 15 minute intervals (averages). Meteorological systems will be calibrated as specified in the ARB manual, "Air Monitoring Quality Assurance, Volume II, Standard Operating Procedures for Air Quality Monitoring." Meteorological data are not collected for the **ambient** monitoring programs.

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III.   Method Validation

A.   Method Detection Limit

The method detection limit (MDL) is defined as the lowest concentration at which individual measurement results for a specific analyte are statistically different from a blank (that may be zero) with a specified confidence level for a given method and matrix.

MDL is defined as 3.14 x s; where s is equal to the standard deviation of seven replicate spiked samples (e.g., XAD sample cartridges). The spiked samples are prepared and analyzed in the same way as actual samples. The spikes should be prepared at a concentration that is between one to five times the estimated MDL.

B.   Estimated Quantitation Limit

The estimated quantitation limit (EQL) is the recommended lowest level for quantitative decisions based on individual measurements for a given method and representative matrix. This EQL is defined as 5 x MDL.

C.   Reproducibility

The reproducibility of the method should be determined by performing five replicates at three different concentrations. The lowest level should be at or near the EQL. The average and standard deviation of each set of replicates should be determined and reported.

D.   Extraction Efficiency

Extraction efficiency is defined as the amount of pesticide recovered from a spiked sample. Three replicates at two levels and blank should be extracted with the average and standard deviation determined for the replicates. The average amount divided by the amount added multiplied by 100 will give the percent recovery. Recommended recoveries should be between 70-130%.

E.   Sampling Efficiency

Sampling efficiency is determined by spiking a sample with a known amount of pesticide. The spiked sample is placed in a sampler and set to the same flow rate and time that samples are collected. At a minimum three replicate spiked samples at a concentration two times the EQL of the method and a collocated background are collected. The samples are extracted and average recovery and standard deviation of the spike samples are determined.

F.   Breakthrough

Breakthrough is determined by using a two stage sampling media (usually a filter or resin). The front stage is spiked with a known quantity of the pesticide. The breakthrough study samples are normally spiked at a relatively high level, e.g., at a level that might be observed

during an application study. If time and resources permit, both low and high level spike studies are run. The backup will be the same filter or resin type and placed in series with the front filter or resin. Air is passed through the sampler at the same flow rate and sample time as a real sample (minimum sample time of 24 hours). The front and backstage are recovered and extracted separately. If breakthrough is observed then the sampling strategy must be reviewed, modified and retested before the start of a sampling project.

G.   Freezer Storage Stability

Spiked samples should be stored under the same conditions as the samples and for the anticipated time that the samples are stored. Recoveries are determined. A high (either at a level expected during the application study or at the high end of the calibration curve) and a low (1 to 2 times the EQL) concentration set should be studied. A set consists of three replicate spikes each for 3 time intervals.

IV.   Field Sampling Quality Control Procedures

Monitoring programs will include the following quality control procedures:

A.   Sample Labels

Sample labels will be affixed either directly to the sampling cartridge or will be placed in the individual sample container (e.g., culture tube or zip-lock bag). The sample labels will include at least the following information.

1. Pesticide name and the ARB project number.
2. Log number
3. Sample I.D.
4. Monitoring Location
5. Sampling end date
6. General comments

B.   Log Sheets

Field data log sheets will be used to record the sampling log number, sample I.D., start and stop dates, start and stop times, start and end flow rate, initials of individuals conducting sampling, malfunctions, leak checks (at the beginning and end of each sampling period, see Appendix I), weather conditions (e.g., rain) and any other pertinent data which could influence sample results. Refer to Appendix I for a recommended log sheet format.

C.   Chain of Custody Forms

Attached as Appendix II is a recommended format for chain of custody (COC) sheets. A COC sheet must accompany any/all samples during transport, transfer or storage. All exchanges of sample possession must be recorded. The laboratory will keep copies of the COCs and

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forward the originals to the project engineer. The original COC sheets must be retained in the pesticide project file.

D.   Flow Controller Calibration and Audit

Field flow controllers (rotameter, electronic flow controller or critical orifice) shall be calibrated against a referenced standard prior to a monitoring period. This referenced standard (e.g., digital bubble flowmeter or electronic digital mass flowmeter) must be verified, certified or calibrated with respect to a primary standard at least once per year by the Quality Management and Operations Support Branch (QMOSB) of ARB. Appendix V shows an example of a form to document the flow controller calibration results.

A flow audit of the field air samplers will be conducted by the QMOSB before each pesticide monitoring project. If results of this audit indicate a difference from the calibrated values of more than 10%, then the field flow controllers should be rechecked until they meet this objective. A written report of the QMOSB audit results will be included as an appendix in the final monitoring report.

Sampling flow rates should be checked in the field and noted before and after each sampling period. A separate, certified flow meter (i.e., not the one used in the sample train to control flow) will be used to check the flow. The flow rates should be checked after the initial sampling system leak check and before the "end" sampling system leak check.

E.   Background Sampling

A background sample will be taken at all sites (4 sides) prior to an **application** test. The duration of the background sample should be sufficient to achieve the pesticide target 24-hour EQL, as directed by the DPR prior to the test, and must be a minimum of twelve hours and up to 24 hours if scheduling permits. This sample will establish if any of the pesticide being monitored is present in the air prior to the application. It also can indicate if other environmental factors are interfering with the detection of the pesticide of concern during analysis.

While one of the sampling sites for **ambient** monitoring is referred to as an "urban area background," it is not a background sample in the conventional sense because the intent is not to find a non-detectable level or a "background" level prior to a particular event (or application). This site is chosen to represent a low probability of finding the pesticide and a high probability of public exposure if significant levels of the pesticide are detected at this urban background site. Detectable levels of some pesticides may be found at an urban area background site if they are marketed for residential as well as commercial/agricultural use. An example of an urban area background site is the ARB air monitoring station in downtown Fresno.

F.   Collocated Samples

For both ambient and application monitoring, the method precision will be demonstrated in part by collecting samples from collocated samplers (replicate analysis of samples also relates to method precision). An additional **ambient** sampler will be collocated at each of the sampling

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sites. Normally, collocated samples will be collected at each **ambient** site every Wednesday for each week of sampling. The samplers should be located at least two meters apart if they are high volume samplers (>20 Lpm) in order to preclude airflow interference. This consideration is not necessary for low flow samplers. The collocated sampler for **application** monitoring should be positioned at the downwind sampling site where the highest concentrations are expected. The collocated site is not changed after the study starts.

G.   Trip Blanks

A trip blank should be included with each batch of samples submitted for analysis. This will usually require one trip blank for an **application** monitoring study and one trip blank per week for an **ambient** monitoring program. Trip blanks are prepared by opening a sampling cartridge (e.g., breaking the ends of an XAD glass tube) in the field followed by normal labeling and sample transport (i.e., along with the samples).

H.   Laboratory, Trip and Field Spikes

The *laboratory, trip and field* spikes are prepared, extracted and analyzed at the same time and they are generally all spiked at the same level. The *laboratory* spikes are immediately placed in the laboratory refrigerator (or freezer) and kept there until extraction and analysis. The *trip* spikes are kept in the freezer until transported to the field. The trip spike samples are kept on dry ice in an ice chest (the same one used for the samples) during transport to and from the field and at all times while in the field except for trip spike sample log-in and labeling. The *field* spikes are stored and transported in the same way as the trip spikes. However, field spikes are obtained by sampling ambient air through the spiked cartridge at the same environmental and experimental conditions as those occurring at the time of the study.

Ambient field spikes are collocated (same location, flow rate and sampling period) with a sample collected at the urban background sampling site (to minimize background concentrations). **Ambient** field spikes are normally prepared at a level of approximately 2 times the EQL, or at a level representative of ambient concentrations.

Application study field spikes are collocated with the background samples collected at the four sides of the application site (i.e., one background and one field spike per side). **Application** field spikes are normally prepared at a level close to expected air concentrations. Field spike results are corrected by subtracting the amount of pesticide residue found in the collocated, unspiked sample before calculation of residue recoveries.

I.   Transportation of Samples

All samples will be capped, placed in a sample container (e.g., culture tube or zip-lock bag) and placed in an ice chest on dry ice immediately following sample collection and labeling. The samples will remain on dry ice until transferred to the laboratory and will then be stored in the lab refrigerator or freezer. Any special handling procedures will be identified during the method validation and will be outlined in the SOP.

J.   Meteorological Station Calibration

Meteorological station calibration procedures will be performed as specified by the ARB manual, "Air Monitoring Quality Assurance, Volume II, Standard Operating Procedures for Air Quality Monitoring."

K.   Preventive Measures

To prevent loss of data, spare pumps and other sampling materials should be kept available in the field by the operator. A periodic check of sampling pumps, meteorological instruments, extension cords, etc., should be made by sampling personnel.

V. Analysis

Method development and analysis of all field samples must be conducted by a fully competent laboratory. To ensure the capability of the laboratory, a systems audit may be performed, upon request, by the ARB Quality Management and Operations Support Branch (QMOSB) prior to the first analysis per a pesticide project. After a history of competence is demonstrated, an audit prior to each pesticide project is not necessary. However, during each pesticide project, the spiked samples discussed above should be provided to the laboratory to demonstrate accuracy and precision. These spiked samples will be prepared by qualified ARB laboratory staff.

If using GC/MS, isotope dilution is the recommended method for quantitation. Isotope dilution is where the isotope analog of the target compound is spiked to the sample prior to sample preparation. The internal standard goes through the same sample and analytical steps that the target analyte does thus compensating for losses during sample preparation and instrument variability during analysis. When no isotope is available an internal standard is recommended. An internal standard is spiked to the sample just prior to analysis. The internal standard compensates for instrument variability. If no suitable internal standard is found then an external standard method may be used.

VI. Analytical Quality Control Procedures

A. Mass Spectrometer Tuning (if MS is used)

A daily tune shall be performed using perfluorotributyl amine (PFTBA). The MS should be calibrated to optimize the MS for the mode of operation and type of pesticide analyzed. Documentation and performance criteria shall be specified in the standard operating procedure. A record of the tune for each batch should kept on file. A daily tune must be performed prior to the analysis of an analysis sequence and every 24 hours during an analysis sequence. If longer intervals between tunes are used, then the stability of the MS must be demonstrated during the method development phase and approved prior to the sample analysis.

B. Calibration

Initial Calibration

At the beginning of method development an initial multi-point calibration curve is performed to demonstrate the calibration range of the pesticide analyzed. A typical multi-point calibration consists of 5 different concentrations with a single replicate at each concentration. The calibration range usually should not exceed 40:1 with the lowest level standard at the EQL unless there is no need to measure values as low as the EQL. Depending on the linear range of the analyte, multi-points with other than 5 levels may be used although a multi-point with less than 3 levels is not permitted. Typically a linear calibration is preferred although a dynamic range using a quadratic is acceptable. For quadratic calibration curves quantitation can only be performed within the calibration range. Sample above the calibration curve must be diluted into the calibration range and reanalyzed.

Daily Calibration

Prior to the analysis of a set of samples a calibration must be performed. This calibration is called the daily calibration. The daily calibration is either a multi-point calibration or a mid-point calibration. The mid-point calibration consists of a single calibration at the mid-point of the initial multi-point calibration curve. If the mid-point is within a prescribed range (i.e., within +/- 20% of the original calibration) as determined from the initial calibration then the original initial calibration is still considered valid and the response is replaced. If the mid-point calibration is outside that range then another multi-point calibration must be performed. A calibration check at the same level is also run. If the mid-point calibration and the midpoint calibration check are within a prescribed range (i.e., +/-20%) of each other then analysis can begin. If the calibration check is outside the specified range then the problem must be rectified before analysis can begin.

C. Reagent Blanks.

A reagent (solvent) blank is performed at least for every batch of reagent used. The reagent blank uses the same solvent that was used for the sample preparation. The blank should be free of interferences. If low level contamination of the pesticide residue is found in the reagent blank (as may happen when using isotope dilution), then a reagent blank will be performed before analysis of each batch of samples. A reagent blank must be analyzed after any sample which results in possible carry-over contamination.

D. Laboratory Control Blank.

A laboratory blank is run with each batch of samples. A laboratory control blank (blank sampling media, e.g., resin cartridge or filter) is prepared and analyzed by the same procedures as used for field samples. Laboratory blank results must be no higher than 20% of the lowest value reported.

E. Laboratory Control Spike.

     A laboratory control spike (LCS) is a resin cartridge spiked (at the level of the midpoint of the daily calibration runs) with a known amount of standard. The LCS is prepared and analyzed the same way as the samples. Two LCS are performed for each batch of samples. Laboratory control spikes need to be within 40% (100*difference/average) of each other and have recoveries that are +/-30% of the theoretical spiked value.   If in the method development stage it is found that the differences or recoveries are larger, then they must be approved by ARB before the analysis can begin.

F. Calibration Check Samples.

     A calibration check sample (CCS) is a mid-point standard run after every tenth sample in an analysis set. The purpose of the CCS is to ensure sample drift is within specified values. The CCS sample must be within +/- 25% of its theoretical value. If the standard is outside this range, then the samples associated with that calibration check sample must be reanalyzed. If in the method development stage it is found that the CCS variation is greater than 25%, then the percent variation limit used for the method must be approved by the ELB Branch Chief before the analysis can begin.

G. Duplicate Analysis.

     A duplicate analysis is a sample analyzed in duplicate as a measure of analytical precision. Every tenth sample of an analysis set must be run in duplicate.

H. Standard Operating Procedures

     Analytical methods must be documented in a Standard Operating Procedure (SOP) before monitoring begins. The recommended format for the SOP is provided in Appendix III. The SOP will include a discussion of all of the procedures outlined above in this section. The SOP will also include a summary of method development results as outlined in Section III above.

VII. Sampling and Analysis Protocol

     Prior to conducting any pesticide monitoring, a sampling and analysis protocol, using this document as a guideline, will be written by the ARB staff. The protocol describes the overall monitoring program, the purpose of the monitoring and includes the following topics:

1.   Identification of the sample site locations, if possible.

2.   Description of the sampling train and a schematic showing the component parts and their relationship to one another in the assembled train, including specifics of the sampling media (e.g., resin type and volume, filter composition, pore size and diameter, catalog number, etc.).

3. Specification of sampling periods and flow rates.

4. Description of the analytical method (SOP included if possible).

5. Tentative test schedule and expected test personnel.

6. Safety information specific to the pesticide monitored.

Specific sampling methods and activities will also be described in the monitoring plan (protocol) for review by ARB and DPR. Procedures which apply to all sampling projects include: (1) sample log sheets (APPENDIX I), (2) chain of custody forms (APPENDIX II), (3) sunlight and rain shields for sample protection during monitoring, (4) sample storage in an ice chest on dry ice until delivery to the laboratory, (5) trip blanks and, (6) laboratory, trip and field spikes. The protocol should include: equipment specifications (when necessary), special sample handling and an outline of sampling procedures. The protocol should specify any procedures unique to a specific pesticide.

VIII. Final Reports and Data Reduction

The mass of pesticide found in each sample should be reported along with the volume of air sampled (from the field data sheet) to calculate the mass per volume for each sample. For each sampling date and site, concentrations should be reported in a table as ug/m^3 (microgram per cubic meter) or ng/m^3 (nanogram per cubic meter). When the pesticide exists in the vapor phase under ambient conditions, the concentration should also be reported as ppbv (parts per billion, by volume) or the appropriate volume-to-volume units at conditions of 1 atmosphere and 25 °C. Collocated samples should be reported separately as raw data, but then averaged and treated as a single sample for any data summaries. For samples where the end flow rate is different from that set at the start of the sampling period, the average of these two flow rates should be used to determine the total sample volume.

The final report should indicate the dates of sampling as well as the dates of laboratory receipt, extraction and analyses. These data can be compared with the stability studies to determine if degradation of the samples has occurred.

Final reports of all monitoring studies are sent to the Department of Pesticide Regulation, the Office of Environmental Health Hazard Assessment, the Department of Health Services, the Agricultural Commissioner's Office, the local AQMD as well as the applicator and/or the grower. Final reports are available to the public by contacting the ARB Engineering and Laboratory Branch.

A. Ambient Reports

The final report for ambient monitoring should include a map of the monitored area which shows nearby towns or communities and their relationship to the monitoring stations, along with a list of the monitoring locations (e.g., name and address of the business or public building)

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including the locations Range/Township/ Section. A site description should be completed for any monitoring site which might have characteristics that could affect the monitoring results (e.g., obstructions). For ambient monitoring reports, information on terrain, obstructions and other physical properties which do not conform to the siting criteria or may influence the data should be described. Information will be collected for each site and reported to DPR regarding; 1) the proximity of the each sampler to treated or potentially treated fields, including the distance and direction, and 2) the distance the sampler is located above the ground.

Ambient data should be summarized for each monitoring location by maximum and second maximum concentration, average ("detected" results are factored in as $(MDL+EQL)/2$, $<MDL$ results are factored in as $MDL/2$), total number of samples, number of samples above the estimated quantitation limit (EQL), number of samples "detected" and the number of samples below the MDL. For this purpose, collocated samples are averaged and treated as a single sample.

B.   Application Reports

Similarly, a map or sketch indicating the general location (nearby towns, highways, etc.) of the field chosen for application monitoring should be included as well as a detailed drawing of the field itself and the relative positions of the monitors. For application monitoring reports, as much data as possible should be collected about the application conditions (e.g., formulation, application rate, acreage applied, length of application and method of application). This may be provided either through a copy of the Notice of Intent, the Pesticide Control Advisor's (PCA) recommendation or completion of the Application Site Checklist (APPENDIX IV). Meteorological data will be reported in 15 minute averages for the application site during the monitoring period. Meteorological and pesticide air concentration data will also be summarized as wind roses for each application sampling period. The raw meteorological data file will also be transferred to DPR on 1.44 mb floppy disk.

C.   Quality Assurance

All quality control and quality assurance samples (blanks, spikes, collocated etc.) analyzed by the laboratory must be reported. Results of all method development and/or validation studies (if not contained in the S.O.P.) will also be reported. The results of any quality assurance activities conducted by an agency other than the analytical laboratory should be included in the report as an appendix. This includes analytical audits, system audits and flow rate audits.

SAMPLE FIELD LOG BOOK
Project: Pesticide Air Monitoring
Project #:

Log #	Sample ID	Date On/Off	Time On/Off	Start Flow	End Flow	Start Leak Check	End Leak Check	Comments	Weather o=overcast pc=partly c=cloudy k=clear	Techn. Initial

APPENDIX II

CHAIN OF CUSTODY FORM

CHAIN OF CUSTODY FORM
CALIFORNIA AIR RESOURCES BOARD
MONITORING AND LABORATORY DIVISION
P.O. Box 2815, Sacramento CA 95812
PESTICIDE
CHAIN OF CUSTODY

SAMPLE RECORD

Job #: _____ Date:_____
Sample/Run #:_____ Time: _____
Job Name: _____
Sample Location: _____
Type of Sample: _____
Log #'s: _____ _____

ACTION	DATE	TIME	INITIALS		METHOD OF STORAGE
Sample Collected					freezer, ice or dry ice
			GIVEN BY	TAKEN BY	
Transfer					
Transfer					
Transfer					
Transfer					
Transfer					
Transfer					

LOG #	ID #	

RETURN THIS FORM TO: _____

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APPENDIX III

ANALYTICAL STANDARD OPERATING PROCEDURE FORMAT

ELEMENTS TO BE INCLUDED IN LABORATORY STANDARD OPERATING PROCEDURES FOR PESTICIDE AIR ANALYSIS

Engineering and Laboratory Branch
Air Resources Board
April 1999

I. SCOPE

   A. Description of scope and detection limits of pesticide(s) to be analyzed.
   B. Documents and references upon which method is based.
   C. Definitions of any special terms must be given.

II. SUMMARY OF METHOD

   A. General description of sampling and analytical procedure. Enough information should be included for an experienced analyst to readily recognize the principles of operation.

III. INTERFERENCES AND LIMITATIONS

   A. Comments made here should cover both analytical and sampling problems, known and potential.

IV. EQUIPMENT AND CONDITIONS

   A. INSTRUMENTATION: As specific a description as possible. Any modifications or improvements of the basic system must have an accompanying schematic. For chromatographic analysis list columns, flow rates, temperatures, detectors, amplifier ranges and attenuations, sample volumes, etc.
   B. AUXILIARY APPARATUS: Provide a description of the function and operating conditions. Include a description of the sampling equipment if the equipment is specific to this method. For example, "Vacuum pump, ACME Model 62, capable of maintaining a 1 CFM Air Flow at 10" vacuum."

V. REAGENTS AND MATERIALS

   A. Provide a list of all reagents used and specify purity and/or grade.
   B. Describe preparation of any special reagents for analysis and sampling.
   C. Specify composition, preparation, and concentrations of stock, intermediate, and working standards.
   D. Describe in detail any necessary safety precautions for handling and disposition of chemicals.

VI. PROCEDURES

A. FIELD SAMPLING TECHNIQUES
1. Refer to appropriate Field Sampling S.O.P. for exact details of sampling, chain of custody and sample identification procedures.
2. Describe equipment used.
3. List sampling conditions: materials, flow rates, etc.
4. Describe any potential problems and limitations, with means of controlling such problems.
5. Describe any methods used to split samples for other types of analyses, if necessary.

B. LABORATORY SAMPLE PREPARATION/PRETREATMENT TECHNIQUES

1. Describe (or refer to an appropriate section of a Laboratory Quality Control Manual) a protocol for sample log-in procedures, including document control and sample examination for damage. Any possible hazards due to toxic or flammable chemicals must be clearly identified. Any sample storage requirements, such as immediate refrigeration or protection for light must be noted.
2. Describe any methods used for preconcentration, dilution clean-up filtration, extraction, concentration, etc., after the sample is received from the field.

C. ANAYSIS

1. Describe as clearly as possible the exact instrument configuration and set-up techniques
2. Describe analysis blank and calibration procedure with associated limits on precision and accuracy. Describe analysis of Control Samples and limits of the resulting data. Describe steps taken in an "out-of-control" situation. Specify the format and location of recorded calibration and Control Sample data.
3. Describe sample analysis. Description must include an example of expected data (for example, a sample chromatogram with all components of interest labeled).
4. Give calculation procedures for results. Describe data recording and data submittal.

VII. PERFORMANCE CRITERIA

A. Describe frequency of duplicate analyses, spikes, field blanks, and acceptable limits of each.
B. Describe frequency of multiple standard analyses to check method linearity and detection limit.
C. If confirmatory method is used, refer to specific S.O.P.

VIII. METHOD VALIDATION

Validation testing should provide an assessment of accuracy, precision, interferences, method recovery, method detection limit and estimated quantitation limit. Method documentation should include confirmation testing with another method when possible, and quality control activities necessary to routinely monitor data quality control such as use of control samples, control charts, use of surrogates to verify individual sample recovery, field blanks, lab blanks and duplicate analysis. All data should be properly recorded in a laboratory notebook.

The method should include the frequency of analysis for quality control samples. Analysis of quality control samples are recommended before each day of laboratory analysis and after every tenth sample. Control samples should be found to be within control limits previously established by the lab performing the analysis. If results are outside the control limits, the method should be reviewed, the instrument recalibrated and the control sample reanalyzed.

All quality control studies should be completed prior to sampling and include recovery data from at least three samples spiked at least two concentrations. Instrument variability should be assessed with three replicate injections of a single sample at each of the spiked concentrations. A stability study should be done with triplicate spiked samples being stored under actual conditions and analyzed at appropriate time internals. This study should be conducted for a minimum period of time equal to the anticipated storage period. Prior to each sampling study, a conversion/collection efficiency study should be conducted under field conditions (drawing ambient air through spiked sample media at actual flow rates for the recommended sampling time) with three replicates at two spiked concentrations and a blank. Breakthrough studies should also be conducted to determine the capacity of the adsorbent material if high levels of pesticide are expected or if the suitability of the adsorbent is uncertain. The following data will be included in the SOP.

    A.   A table describing linearity (correlation coefficients), accuracy (method bias), precision (standard deviations at all levels analyzed), and detection.
    B.   Data on sampling efficiencies, stability, pertinent breakdown products, break through volumes and desorption efficiencies.
    C.   Data on storage stability and conditions for samples and standards.
    D.   References to quality assurance information derived from published and/or interlaboratory sources if available.

APPENDIX IV

APPLICATION CHECKLIST

APPLICATION CHECKLIST

1. Pesticide:	
2. County:	
3. Crop:	
4. Field Address:	
5. Field Location (R/T/S):	
6. Field Size (acres):	
7. Contact Person:	
8. Background Monitoring Period:	
9. Target EQL Met?:	
10. Product Applied:	
11. Application Rate:	
12. Comments on Tank Mix:	
13. Method of Application (ground, air, irrigation, injection, tarping etc.):	
14. Start of Application:	
15. End of Application:	
16. Pattern of Application: (e.g., east to west):	
17. Weather Conditions:	
18. Met Station Location (and elevation):	
19. Any Other Applications in Area:	
20. Sampler Elevations:	

___ Camera pictures of each sampler from all 4 directions
___ Camcorder video of each sampler in relation to field and surroundings
___ Rotameter #s logged
___ Check dimensions of field with known acreage (43560 ft^2/acre) & compare sides
___ Crops around field labeled on diagram

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FLOW CONTROLLER; 1-POINT FLOW CALIBRATION SHEET

Project: _____   Pre: _____   **Project #:** _____   **Date:** _____

Post _____

:

Desired Flow Rate: _____   **Calib. by:** _____

(name)

BUBBLEMETER READINGS

Controller ID:

Controller Set:

  -Readings:

  -Readings:

  -Readings:

Average:

Deviation:

Controller ID:

Controller Set:

  -Readings:

  -Readings:

  -Readings:

Average:

Deviation:

Average of Averages _____ :

_____

PROCEDURE

1. Set-up sampler as if to collect sample, including filled sample cartridge.
2. Set flow controller to achieve desired flowrate and record controller setting.
3. Observe and record Bubblemeter flow (on form or direct to floppy - Change File name).
4. Reset to zero. Then repeat step 3 two more times.
5. Calculate the average of 3 readings.
6. Repeat steps 1 thru 5 for each Rotameter.
7. Average of Averages and Deviation automatically calculated. Replace any Rotameters that deviate by 10% or more from the Average of Averages.
8. QA Section will get a copy for comparison with their results for the same setups.

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Appendix B

Standard Operating Procedures for the
Analysis of Benomyl and n-Butyl Isocyanate in Ambient Air

[SEE APPENDIX II AND III]

California Environmental Protection Agency

⊜≡ Air Resources Board

**Benomyl Method Development and Benomyl Analytical
Results for Ambient Monitoring and Application Samples**

**Final Report Prepared by
Jim Omand
Special Analysis Section
Northern Laboratory Branch
Monitoring and Laboratory Division**

DATE: September 22, 2000

Reviewed and Approved by

**Michael P. Spears, Manager
Special Analysis Section**

**Michael Poore, Chief
Northern Laboratory Branch**

Project Number: C99-108

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1.0   INTRODUCTION

The Department of Pesticide Regulation (DPR) requested the Air Resources Board (ARB) to develop an air sampling and analysis method and conduct ambient air and application site monitoring for benomyl. This report covers method development, analytical results, and quality assurance results for benomyl. The method measures benomyl as it's breakdown product carbendazim. The method estimated quantitation limit (EQL) is 170 ng/sample of benomyl. The final benomyl standard operating procedure (SOP) is attached as Appendix 1.

2.0   METHOD DEVELOPMENT AND STANDARD OPERATING PROCEDURE.

2.1   Overview

The method uses XAD-2 sorbent tubes for sample collection. Collected samples are desorbed by sonicating the sample resin in 4 ml of acetonitrile and then held for a minimum of 8 hours prior to analysis to allow the conversion of benomyl to it's breakdown product carbendazim. The samples are analyzed for carbendazim using reverse phase liquid chromatography and UV detection at 280 nm.

2.2   Instrument Reproducibility

Five injections of 100 µl each were made of benomyl standards at three concentrations in order to establish the reproducibility of the ion chromatograph used for this project (Table 1.)

2.3   Calibration

Calibration of the instrument uses 62.5 – 1000 ng/ml standards to produce a 5-point calibration curve for each analysis batch. The calibration standards for the method use benomyl standards, which have undergone conversion to carbendazim. Calibration curves used for sample analysis each have a correlation coefficient value of > 0.995.

2.4.   Minimum Detection Limit (MDL)

The method follows standard United States Environmental Protection Agency (USEPA) procedures to calculate the MDL. Using the analysis of seven low-level spikes (25 ng/ml), the MDL and EQL for a 4 ml extract is calculated by:

---

s = the standard deviation of the concentration calculated for the seven replicate spikes.
For benomyl s = 2.7 ng/ml

$$MDL = (3.14)*(s) \text{ (4 ml extraction)} = 34 \text{ ng/sample.}$$
$$EQL = (5)*(MDL) = 170 \text{ ng/sample}$$

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Results equal to or above the EQL are reported to three (3) significant figures. Results below the EQL but greater than or equal to the MDL are reported as detected (DET). Results less than MDL are reported as <MDL.

2.5. Collection and Extraction Efficiency (Recovery)

Six (6) XAD-2 sample tubes were used to determine method recovery. The primary section of three (3) sample tubes were spiked with 250 ng of benomyl standard and three (3) others with 2000 ng. The spiked tubes were then subjected to an airflow of 2.5 lpm for 24 hours at ambient temperature. The primary section of the spiked tubes was extracted with pesticide grade acetonitrile. The extracts were filtered and held at room temperature for a minimum of 8 hours to allow for conversion to carbendazim prior to analysis. The results are presented below.

Benomyl Spike	Mean Percent Recovery	RSD
250 ng	112%	22.0%
2000 ng	101%	2.6%

2.6. Storage Stability

Staff spiked the primary sections of three (3) tubes with benomyl at 250ng and three (3) tubes at 2000 ng for each week of storage. The spiked tubes were stored in the freezer and extracted/analyzed on storage weeks 0, 2, 4 and 8. The storage recoveries (average results) are shown below.

8 week Storage Stability Study (Percent storage recoveries)		
Week	250 ng	2000 ng
0	50%	81%
2	76%	82%
4	65%	91%
8	61%	96%

2.7. Breakthrough

Staff spiked the primary sections of three tubes with 2000 ng/tube, and placed them in a field sampler for 24 hours at 2.5 lpm. Analysis of the back-up resin beds did not detect benomyl above MDL in any of the spiked tubes.

3.0 BENOMYL AMBIENT AIR MONITORING SAMPLE RESULTS.

The laboratory received a total of 165 ambient and QA samples for analysis from 02/07/00 to 03/14/00. Field samples include six (6) trip blanks (one for each week of monitoring) and six (6) field spikes. Six (6) trip spikes and six (6) laboratory spikes were also analyzed. Extraction and analysis of all ambient samples was complete within 28 days of receipt. Table 2 lists the results for the analysis of the benomyl ambient samples.

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4.0 AMBIENT ANALYTICAL QUALITY CONTROL

4.1 Laboratory solvent blanks

Staff analyzed a laboratory solvent blank (acetonitrile) to evaluate the analysis for reagent interference with each of the ambient analytical sample batches (Staff defines a batch as the samples in an automated LC analysis sequence). All solvent blank results are less than the MDL.

4.2 Laboratory control blanks

Each sample set included a laboratory control blank. A blank XAD-2 cartridge is prepared and analyzed as described for the ambient samples. All control blank results are less than the MDL.

4.3 Laboratory control solutions

Two laboratory control solutions are analyzed with each set of samples. The control solutions were spiked directly into acetonitrile from a stock solution other than the stock used to prepare method calibrators. One control solution is spiked with 250 ng/ml benomyl and the other control solution is spiked with 250 ng/ml carbendazim. The control solutions are used to evaluate method performance independent of sample preparation variables. It is important to note that the calibration curve is constructed using benomyl standards that are converted into carbendazim. As such a pure carbendazim standard will produce a value 1.516 times higher when evaluated against a converted benomyl cailbration curve.

The recoveries for the 250 ng/ml benomyl solution averaged 262 ng/ml, with a standard deviation of 22.4 ng/ml. The recoveries for the 250 ng/ml carbendazim solution (target value as benomyl 379 ng/ml) averaged 371 ng/ml, with a standard deviation of 21.5 ng/ml. Table 4 contains the control solution results.

4.4 Laboratory control spikes

Laboratory analysis includes two levels of laboratory control spikes with each set of samples. Both are resin tubes, one is spiked with 250 ng of benomyl and the other is spiked with 2000 ng of benomyl. Both are prepared and analyzed as described for the samples. The recoveries for the 250 ng benomyl spike averaged 200 ng, with a standard deviation of 43 ng. The recoveries for the 2000 ng benomyl spike averaged 1560 ng, with a standard deviation of 166 ng. See Table 5 for analytical results.

4.5 Calibration check samples

A calibration check sample is analyzed after every tenth sample in an analysis batch. The

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average value for the 250 ng/ml check standards used for ambient analysis is 258 ng/ml, with a standard deviation of 14.9 ng/ml. All check sample results were within 15% of their target value (250 ng/ml).

5.0 AMBIENT FIELD, TRIP, AND LABORATORY SPIKES AND TRIP BLANKS

Two levels of spikes were evaluated for ambient quality control monitoring. Three (3) laboratory spikes, three (3) trip spikes and three (3) field spikes were prepared at 250 ng and 2000 ng spiking levels. Ambient spike results are listed in Table 3.

5.1 Laboratory spikes

Three (3) tubes each were spiked with 250 ng and 2000 ng of benomyl and stored in the freezer until analysis. The average recovery for the 250 ng spike was 214 ng, with a standard deviation of 8.1 ng. The average recovery for the 2000 ng spike was 1585 ng, with a standard deviation of 34 ng.

5.2 Trip spikes

Three (3) tubes each were spiked with 250 ng and 2000 ng of benomyl. The average recovery for the 250 ng spike was 233 ng, with a standard deviation of 21 ng. The average recovery for the 2000 ng spike was 1576 ng, with a standard deviation of 21 ng.

5.3 Field spikes

Three (3) tubes each were spiked with 250 ng and 2000 ng of benomyl. The average recovery for the 250 ng spike was 342 ng, with a standard deviation of 69 ng. The average recovery for the 2000 ng spike was 1649 ng, with a standard deviation of 81 ng.

5.4 Trip blanks

Six (6) trip blanks were collected, one for each week of ambient monitoring. No trip blank was above the MDL.

6.0 BENOMYL APPLICATION SAMPLE RESULTS

6.1 Application Samples

The laboratory received one hundred and two (102) application samples on 03/01/00, which included six (6) field spikes, one (1) trip blank and one (1) trip blank. In addition six (6) trip spikes and six (6) laboratory spikes were analyzed. Analysis was complete on 03/20/00. Table 6 lists the results for the analysis of the benomyl application samples.

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7.0 APPLICATION ANALYTICAL QUALITY CONTROL

7.1 Laboratory solvent blanks

A laboratory solvent blank, which is the acetonitrile used for extraction and preparation of the standards, is analyzed with each of the application analytical sample batches (Staff defines a batch as the samples in an automated LC analysis sequence). Solvent blanks serve to evaluate the analysis for reagent interference. All solvent blank results were less than the method MDL.

7.2 Laboratory control blanks

A laboratory control blank is analyzed with each sample set. A blank XAD-2 cartridge is prepared and analyzed as described for the ambient samples. All control blank results were less than the MDL.

7.3 Laboratory control solutions

Each sample batch contains two laboratory control solutions to evaluate the performance of the analytical method without considering extraction variables. Staff prepared the control solutions by spiking directly into acetonitrile from a stock solution other than the stock solution used to prepare method calibrators. One control solution is spiked with 250 ng/ml benomyl and the other control solution is spiked with 250 ng/ml carbendazim.

The recoveries for the 250 ng/ml benomyl solution averaged 251 ng/ml, with a standard deviation of 9.6 ng/ml. The recoveries for the 250 ng/ml carbendazim solution (target value as benomyl 379 ng/ml) averaged 377 ng/ml, with a standard deviation of 27.6 ng/ml. Table 8 contains the control solution results.

7.4 Laboratory control spikes

Each sample set contained two levels of laboratory control spikes for analysis. One control is a resin tube spiked with 250 ng of benomyl and the other control contains a spike of 2000 ng of benomyl. The control sample is prepared and analyzed as described for the samples. The recoveries for the 250 ng benomyl spike averaged 144 ng, with a standard deviation of 23 ng. The recoveries for the 2000 ng benomyl spike averaged 1566 ng, with a standard deviation of 162 ng. Table 9 contains the control spike results.

7.5 Calibration check samples

Every tenth sample in an analysis batch is a calibration check sample. The average value for 250 ng/ml check standards used for ambient analysis is 261 ng/ml, with a standard deviation of 11.0 ng/ml. All check sample results were within 15% of their 250 ng/ml target value.

8.0 APPLICATION FIELD, TRIP, AND LABORATORY SPIKES AND TRIP BLANKS

Six (6) laboratory spikes, six (6) trip spikes and six (6) field spikes were analyzed for the benomyl application test. The spikes were prepared at 250 ng/sample and 2000 ng/sample on 02/15/00. Table 7 contains the results for the analyses of application spikes.

8.1 Laboratory spikes

Six (6) laboratory spikes were stored in the freezer until analysis. The average recovery was 138 ng for the 250 ng spikes and 1659 ng for the 2000 ng spikes.

8.2 Trip spikes

Six (6) trip spikes accompanied samples to the sampling site. These trip spikes returned to the laboratory along with the samples. The average recovery for the 250 ng spikes was 185 ng and the average recovery for the 2000 ng spikes was 1531 ng.

8.3 Field spikes

Six (6) field spikes were sent to the sampling site. The field spikes were treated in the same manner as a standard sample. The average recovery for the 250 ng spikes was 225 ng and the average recovery for the 2000 ng spikes was 1536 ng.

8.4 Trip and field blanks

One (1) application trip blank was analyzed. Benomyl blank results are less than the MDL.

9.0 DISCUSSION

The analytical method appears to perform adequately in all areas except specificity. Preliminary ambient sampling at ARB Fresno, ARB 13th & T Sacramento monitoring station and ARB indoors at 14th & S Sacramento gave positive benomyl results as high as 603 ng/sample (168 ng/m3). It seems probable that these are false positive results. The interference has a slightly longer retention time (7 seconds) and can be identified in analytical batches by applying statistical analysis using the known carbendazim samples. The retention time (RT) for carbendazim is determined as the mean RT of all control samples in each batch (n > 14) plus or minus two standard deviations. However, on analytical batches with retention time drift the statistical analysis may not eliminate all false positives.

Samples were sent to California Department of Food and Agriculture (CDFA) for LC/MS analysis but the UV method interference could not be identified. All ARB results greater than EQL were analyzed by the CDFA LC/MS method (Table 10). All ambient samples analyzed by CDFA were below their reporting limit of 30 ng/ml. The application samples

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analyzed showed good agreement between both methods with the exception of sample BAP93 (CS210). Seven negative (<MDL) samples were sent to CDFA for confirmation. All seven negative samples, positive as reported by the ARB instrument, were negative when subjected to statistical analysis of the retention time. The LCMS confirmation found all seven samples to be below CDFA reporting limit. These negative results indicate that false negatives are not a problem with the ARB UV results.

The ultraviolet detector used for the current study is not specific enough to be used for samples with a complex matrix, such as the resin samples collected for the current study. Staff recommends that future studies of this type should use a more specific detection system such as diodearray or mass spectrometry.

TABLE 1: Instrument Reproducibility

Amount benomyl ng/ml	Instrument Response	Std. Dev. / Mean = C.V.
62.5	12080 11710 11100 11449 11192	399/11506 = 3.5%
125	24413 26447 27258 27386 26477	1190/26396 = 4.5%
500	113616 114733 115900 117793 116842	1656/115777 = 1.4%

- Instrument Response = uncalibrated integrator area
- Std. Dev. = Standard deviation of 5 replicate instrument responses
- Mean = Average of 5 replicate instrument responses
- C.V. = Coefficient of variation (expressed as %, C.V. x 100)

Table 2. Ambient Air Monitoring Results

Log i.d.	Sample Name	Analysis Date	Sample Amount (ng/sample)
1	SCH1	02/08/00	430
2	PLA1	02/08/00	191
3	HOW1	02/08/00	<MDL
4	RIV1	02/08/00	233
5	ARB1	02/08/00	428
6	FS1	02/08/00	332
7	FS2	02/08/00	280
8	FS3	02/08/00	416
9	PLA2	02/14/00	<MDL
10	SCH2	02/14/00	<MDL
11	HOW2	02/14/00	<MDL
12	RIV2	02/14/00	<MDL
13	ARB2	02/14/00	<MDL
14	FS4	02/14/00	1560
15	FS5	02/14/00	1690
16	FS6	02/14/00	1700
17	PLA3	02/16/00	<MDL
18	PLA3D	02/16/00	<MDL
19	SCH3	02/16/00	<MDL
20	SCH3D	02/16/00	<MDL
21	HOW3	02/16/00	<MDL
22	HOW3D	02/16/00	<MDL
23	RIV3	02/16/00	<MDL
24	RIV3D	02/16/00	<MDL
25	BLANK	02/16/00	<MDL

Log i.d.	Sample Name	Analysis Date	Sample Amount (ng/sample)
26	ARB3	02/16/00	<MDL
27	ARB3D	02/16/00	<MDL
28	PLA4	02/16/00	<MDL
29	SCH4	02/16/00	<MDL
30	HOW4	02/16/00	<MDL
31	RIV4	02/16/00	<MDL
32	ARB4	02/16/00	<MDL
33	ARB5	02/23/00	<MDL
34	PLA5	02/23/00	<MDL
35	SCH5	02/23/00	<MDL
36	HOW5	02/23/00	<MDL
37	RIV5	02/23/00	<MDL
38	ARB6	02/23/00	<MDL
39	PLA6	02/23/00	<MDL
40	SCH6	02/23/00	<MDL
41	HOW6	02/23/00	<MDL
42	RIV6	02/23/00	<MDL
43	ARB7	02/23/00	<MDL
44	ARB7D	02/23/00	<MDL
45	PLA7	02/23/00	<MDL
46	PLA7D	02/23/00	<MDL
47	SCH7	02/23/00	<MDL
48	SCH7D	02/23/00	<MDL
49	HOW7	03/01/00	<MDL
50	HOW7D	03/01/00	<MDL

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Log i.d.	Sample Name	Analysis Date	Sample Amount (ng/sample)
51	RIV7	03/01/00	<MDL
52	RIV7D	03/01/00	<MDL
53	ARB8	03/01/00	<MDL
56	PLA8	03/01/00	<MDL
57	SCH8	03/01/00	<MDL
59	HOW8	03/01/00	<MDL
60	RIV8	03/01/00	<MDL
61	BLANK	03/01/00	<MDL
62	ARB9	03/01/00	<MDL
63	PLA9	03/01/00	NA
64	SCH9	03/01/00	<MDL
65	HOW9	03/01/00	<MDL
66	RIV9	03/01/00	<MDL
67	ARB10	03/01/00	<MDL
68	PLA10	03/01/00	<MDL
69	SCH10	03/01/00	<MDL
70	HOW10	03/01/00	<MDL
71	RIV10	03/01/00	<MDL
72	ARB11	03/01/00	<MDL
73	ARB11D	03/01/00	<MDL
74	PLA11	03/06/00	<MDL
75	PLA11D	03/06/00	<MDL
76	SCH11	03/06/00	254
77	SCH11D	03/06/00	424
78	HOW11	03/06/00	366
79	HOW11D	03/06/00	428
80	RIV11	02/23/00	340

Log i.d.	Sample Name	Analysis Date	Sample Amount (ng/sample)
81	RIV11D	03/06/00	174
82	ARB12	03/06/00	<MDL
83	PLA12	03/06/00	<MDL
84	SCH12	03/06/00	<MDL
85	HOW12	03/06/00	<MDL
86	RIV12	03/06/00	<MDL
87	BLANK	03/06/00	<MDL
88	ARB13	03/06/00	<MDL
89	PLA13	03/06/00	<MDL
90	SCH13	03/06/00	DET
91	HOW13	03/06/00	<MDL
92	RIV13	03/06/00	<MDL
93	ARB14	03/06/00	<MDL
94	PLA14	03/21/00	<MDL
95	SCH14	03/21/00	<MDL
96	HOW14	03/21/00	<MDL
97	RIV14	03/21/00	<MDL
98	ARB15	03/21/00	<MDL
99	ARB15D	03/21/00	<MDL
100	PLA15	03/21/00	<MDL
101	PLA15D	03/21/00	<MDL
102	SCH15	03/21/00	<MDL
103	SCH15D	03/21/00	<MDL
104	HOW15	03/21/00	<MDL
105	HOW15D	03/21/00	<MDL
106	RIV15	03/21/00	<MDL
107	RIV15D	03/21/00	<MDL

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Log i.d.	Sample Name	Analysis Date	Sample Amount (ng/sample)
108	ARB16	03/21/00	<MDL
109	PLA16	03/21/00	<MDL
110	SCH16	03/21/00	<MDL
111	HOW16	03/21/00	<MDL
112	RIV16	03/21/00	178
113	BLANK	03/21/00	<MDL
114	ARB17	03/21/00	<MDL
115	PLA17	03/21/00	<MDL
116	SCH17	03/21/00	<MDL
117	HOW17	03/21/00	<MDL
118	RIV17	03/21/00	<MDL
119	ARB18	03/21/00	<MDL
120	PLA18	03/21/00	DET
121	SCH18	04/04/00	<MDL
122	HOW18	04/04/00	<MDL
123	RIV18	04/04/00	<MDL
124	ARB19	04/04/00	<MDL
125	ARB19D	04/04/00	<MDL
126	PLA19	04/04/00	<MDL
127	PLA19D	04/04/00	<MDL
128	SCH19	04/04/00	<MDL
129	SCH19D	04/04/00	<MDL
130	HOW19	04/04/00	<MDL
131	HOW19D	04/04/00	<MDL
132	RIV19	04/04/00	<MDL
133	RIV19D	04/04/00	<MDL
134	ARB20	04/04/00	<MDL

Log i.d.	Sample Name	Analysis Date	Sample Amount (ng/sample)
135	PLA20	04/04/00	DET
136	SCH20	04/04/00	<MDL
137	HOW20	04/04/00	<MDL
138	BLANK	04/04/00	<MDL
139	RIV20	04/04/00	<MDL
140	ARB21	04/04/00	<MDL
141	PLA21	04/04/00	<MDL
142	SCH21	04/04/00	<MDL
143	HOW21	04/04/00	<MDL
144	RIV21	04/04/00	<MDL
145	ARB22	04/05/00	<MDL
146	PLA22	04/05/00	<MDL
147	SCH22	04/05/00	<MDL
148	HOW22	04/05/00	DET
149	RIV22	04/05/00	<MDL
150	ARB23	04/05/00	<MDL
151	ARB23D	04/05/00	DET
152	PLA23	04/05/00	<MDL
153	PLA23D	04/05/00	<MDL
154	SCH23	04/05/00	DET
155	SCH23D	04/05/00	<MDL
156	HOW23	04/05/00	<MDL
157	HOW23D	04/05/00	DET
158	RIV23	04/05/00	<MDL
159	RIV23D	04/05/00	<MDL
160	ARB24	04/05/00	<MDL
161	PLA24	04/05/00	<MDL

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Log i.d.	Sample Name	Analysis Date	Sample Amount (ng/sample)
162	SCH24	04/05/00	<MDL
163	HOW24	04/05/00	<MDL
164	RIV24	04/05/00	<MDL
165	BLANK	04/05/00	<MDL

Table 2 Notes: Ambient Air Monitoring

Sample log i.d. #54,#55and #58 were not included as
log numbers. No samples were collected for these
numbers. Sample log i.d. #63 – resin tube was broken.

If analysis result is $\geq$ MDL and < EQL it is reported in the
table as detected (DET). Levels $\geq$ EQL of 170 ng/sample
are reported as the actual measured value and are
reported to three significant figures.

<MDL = benomyl less than 34 ng/sample
 Det = benomyl amount $\geq$ 34 ng/sample (MDL) and < 170
ng/sample (EQL).

Site location i.d.:
SCH: Schelby School
PLA: Plainsburg School
HOW: Howard School
ARB: ARB in Fresno
RIV: Riverview School

Table 3: Ambient Spike Results

Sample #	Date Spiked	Date Analyzed	Benomyl (ug/sample)	Percent Recovery
Laboratory				
LS-1	01/28/00	02/08/00	0.220	88
LS-2	01/28/00	02/08/00	0.218	87
LS-3	01/28/00	02/08/00	0.205	82
LS-4	01/28/00	02/15/00	1.62	81
LS-5	01/28/00	02/15/00	1.55	78
LS-6	01/28/00	02/15/00	1.59	80
Trip				
TS-1	01/28/00	02/11/00	0.253	100
TS-2	01/28/00	02/14/00	0.236	94
TS-3	01/28/00	02/16/00	0.211	84
TS-4	01/28/00	02/15/00	1.58	79
TS-5	01/28/00	02/15/00	1.56	78
TS-6	01/28/00	02/15/00	1.60	80
Field				
FS-1	01/28/00	02/08/00	0.332	133
FS-2	01/28/00	02/08/00	0.280	112
FS-3	01/28/00	02/08/00	0.416	166
FS-4	01/28/00	02/15/00	1.55	78
FS-5	01/28/00	02/15/00	1.69	85
FS-6	01/28/00	02/15/00	1.71	86

Table 4: Ambient Laboratory Control Solutions

Date Analyzed	Benomyl 250 ng/ml	Carbendazim 250 ng/ml
02/08/00	290	386
02/14/00	301	376
02/16/00	265	391
02/23/00	252	387
03/01/00	245	386
03/06/00	275	357
03/21/00	252	378
04/04/00	242	341
04/05/00	236	333

Table 5: Ambient Laboratory Control Spikes

Date Analyzed	Benomyl 250 ng/ml	Carbendazim 250 ng/ml
03/08/00	251	421
03/13/00	237	369
03/14/00	263	399
03/16/00	249	360
03/20/00	261	356

Table 6: Application Monitoring Results

Log #	Sample Name	Analysis Date	Results ng/sample
1	BG1WC	03/08/00	<MDL
2	BG2NC	03/08/00	<MDL
3	BG3EC	03/08/00	<MDL
4	BG4SC	03/08/00	<MDL
5	FS1WC	03/08/00	1550
6	FS2WC	03/08/00	1620
7	FS3WC	03/08/00	1440
8	FS4EC	03/08/00	208
9	FS5EC	03/08/00	217
10	FS6EC	03/08/00	249
11	CW1	03/08/00	<MDL
12	CN21	03/08/00	0182
13	CE1	03/08/00	<MDL
14	CED1	03/08/00	275
15	CS31	03/08/00	<MDL
16	CS11	03/08/00	<MDL
17	CN31	03/08/00	<MDL
18	CN11	03/08/00	<MDL
19	CS21	03/13/00	<MDL
20	CS12	03/13/00	<MDL
21	CS22	03/13/00	<MDL
22	CS32	03/13/00	<MDL
23	CS42	03/13/00	<MDL
24	CN12	03/13/00	<MDL
25	CN22	03/13/00	<MDL
26	CN2D2	03/13/00	<MDL

Log #	Sample Name	Analysis Date	Results ng/sample
27	CN32	03/13/00	<MDL
28	CN42	03/13/00	<MDL
29	CS13	03/13/00	<MDL
30	CS23	03/13/00	<MDL
31	CS33	03/13/00	<MDL
32	CS43	03/13/00	<MDL
33	CN13	03/13/00	<MDL
34	CN23	03/13/00	DET
35	CN2D3	03/13/00	233
36	CN33	03/13/00	<MDL
37	CN43	03/13/00	<MDL
38	CS14	03/13/00	<MDL
39	CS24	03/13/00	<MDL
40	CS34	03/13/00	<MDL
41	CS44	03/13/00	<MDL
42	CN14	03/13/00	<MDL
43	CN24	03/15/00	<MDL
44	CN2D4	03/15/00	<MDL
45	CN34	03/15/00	<MDL
46	CN44	03/15/00	<MDL
47	CS15	03/15/00	<MDL
48	CS25	03/15/00	<MDL
49	CS35	03/15/00	<MDL
50	CS45	03/15/00	<MDL
51	CN15	03/15/00	<MDL
52	CN25	03/15/00	<MDL
53	CN2D5	03/15/00	<MDL

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Log #	Sample Name	Analysis Date	Results ng/sample
54	CN35	03/15/00*	<MDL
55	CN45	03/15/00	<MDL
56	CS16	03/15/00	<MDL
57	CS26	03/15/00	<MDL
58	CS36	03/15/00	<MDL
59	CS46	03/15/00	<MDL
60	CN16	03/15/00	<MDL
61	CN26	03/16/00	<MDL
62	CN2D6	03/16/00	<MDL
63	CN36	03/16/00	<MDL
64	CN46	03/16/00	<MDL
65	CS17	03/16/00	<MDL
66	CS27	03/16/00	<MDL
67	CS37	03/16/00	183
68	CS47	03/16/00	<MDL
69	CN17	03/16/00	<MDL
70	CN27	03/16/00	341
71	CN2D7	03/16/00	<MDL
72	CN37	03/16/00	<MDL
73	CN47	03/16/00	<MDL
74	CS18	03/16/00	<MDL
75	CS28	03/16/00	<MDL
76	CS38	03/16/00	<MDL
77	CS48	03/16/00	<MDL
78	CN18	03/16/00	<MDL

Log #	Sample Name	Analysis Date	Results ng/sample
79	CN28	03/16/00	<MDL
80	BC2D8	03/16/00	<MDL
81	CN38	03/16/00	DET
82	CN48	03/16/00	<MDL
83	CS19	03/16/00	<MDL
84	CS29	03/16/00	<MDL
85	CS39	03/16/00	<MDL
86	CS49	03/20/00	<MDL
87	CN19	03/20/00	<MDL
88	CN29	03/20/00	<MDL
89	CN2D9	03/20/00	<MDL
90	CN39	03/20/00	<MDL
91	CN49	03/20/00	<MDL
92	CS110	03/20/00	<MDL
93	CS210	03/20/00	178
94	CS310	03/20/00	DET
95	CS410	03/20/00	DET
96	CN110	03/20/00	<MDL
97	CN210	03/20/00	<MDL
98	CN2D10	03/20/00	<MDL
99	CN310	03/20/00	<MDL
100	CN410	03/20/00	<MDL
101	CFBLANK	03/20/00	<MDL
102	CTBLANK	03/20/00	<MDL

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Table 6 Notes: Application Air Monitoring Results
Application samples were received on 03/06/00. Sample analysis was completed by 03/20/00.

If analysis result is $\geq$ MDL and < EQL it is reported in the table as detected (DET). Levels $\geq$ EQL of 170 ng/sample are reported as the actual measured value and are reported to three significant figures.

<MDL = benomyl less than 34 ng/sample
 Det = benomyl amount $\geq$ 34 ng/sample (MDL) and < 170 ng/sample (EQL).

Table 7: Application Spike Results

Sample #	Date Spiked	Date Analyzed	Benomyl (ng/sample)	Percent Recovery
Laboratory				
LS-1	02/15/00	03/08/00	138	55
LS-2	02/15/00	03/08/00	138	55
LS-3	02/15/00	03/08/00	137	55
LS-4	02/15/00	03/08/00	1683	84
LS-5	02/15/00	03/08/00	1742	87
LS-6	02/15/00	03/08/00	1553	78
Trip				
TS-1	02/15/00	03/21/00	180	72
TS-2	02/15/00	03/21/00	189	76
TS-3	02/15/00	03/21/00	185	74
TS-4	02/15/00	03/21/00	1574	79
TS-5	02/15/00	03/21/00	1708	85
TS-6	02/15/00	03/21/00	1312	66
Field				
FS-1	02/15/00	03/08/00	1552	78
FS-2	02/15/00	03/08/00	1620	81
FS-3	02/15/00	03/08/00	1436	72
FS-4	02/15/00	03/08/00	208	83
FS-5	02/15/00	03/08/00	217	87
FS-6	02/15/00	03/08/00	249	100

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Table 8: Application Laboratory Control Solutions

Date Analyzed	Benomyl 250 ng/ml	Carbendazim 250 ng/ml
03/08/00	251	421
03/13/00	237	369
03/14/00	263	399
03/16/00	249	360
03/20/00	261	346

Table 9: Application Laboratory Control Spikes

Date Analyzed	Benomyl 250 ng/ml	Carbendazim 250 ng/ml
03/08/00	251	421
03/13/00	237	369
03/14/00	263	399
03/16/00	249	360
03/20/00	261	356

Table 10: ARB and CDFA Results

Quality Control Samples

Sample #	Sample Name	ARB Results ng/ml	CDFA Results ng/ml	Comments
	XAD-2 resin blank	<MDL	N/F	
	62.5 ng/ml spike	58	68	XAD-2 resin spike
BAP 10	FS6EC	62	39	62.5 ng/ml field spike

Ambient Samples

Sample #	Sample Name	ARB Results ng/ml	CDFA Results ng/ml	Comments
BA 1	SCH1	108	N/F	sample collected 2/8/00
BA 2	PLA1	48	N/F	sample collected 2/8/00
BA 4	RIV1	58	N/F	sample collected 2/8/00
BA 5	ARB1	107	N/F	sample collected 2/8/00
BA 34	PLA5	<MDL*	N/F	
BA 36	HOW5	<MDL*	N/F	
BA 39	PLA6	<MDL*	N/F	
BA 41	HOW6	<MDL*	N/F	
BA 77	SCH11D**	106	N/F	sample collected 2/16/00
BA 78	HOW11	92	N/F	sample collected 2/16/00
BA 79	HOW11D	107	N/F	sample collected 2/16/00
BA80	RIV11	85	N/F	sample collected 2/16/00
BA 81	RIV11D	44	N/F	sample collected 2/16/00
BA 88	ARB13	<MDL*	N/F	
BA 110	SCH16	<MDL*	N/F	
BA 112	RIV16	45	N/F	

Application Samples

Sample #	Sample Name	ARB Results ng/ml	CDFA Results ng/ml	Comments
BAP 12	CN21	46	50	
BAP 14	CED1	54	56	
BAP 17	CN31	<MDL*	N/F	
BAP 35	CN2D3	58	54	
BAP 67	CS37	46	53	
BAP 70	CN27	85	100	
BAP 93	CS210	45	N/F	

N/F - less than 30 ng/ml by CDFA LC/MS method

<MDL - less than 7.4 ng/ml by ARB LC/UV method

* - positive by instrument parameters (RT +/- 0.5 minutes), negative by statistical analysis (RT +/- 2sd)

** - duplicate (SCH11) was submitted to CDFA but quantity was insufficient for LC/MS analysis

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Appendix: Standard Operating Procedure for Benomyl

California Environmental Protection Agency

⬤≡Air Resources Board

Evaluation Section
Engineering and Laboratory Branch
Monitoring and Laboratory Division

Standard Operating Procedure for the Determination of
Benomyl as Its Breakdown Product, Carbendazim, In
Ambient Air

1/31/00 version

Approved by:
Michael P. Spears, Manager
Evaluation Section

Standard Operating Procedure for the Determination of Benomyl as Its Breakdown
Product, Carbendazim, In Ambient Air

1.   SCOPE

This document describes a High Performance Liquid Chromatography (HPLC)
procedure for the determination of benomyl measured as its breakdown product,
carbendazim, from ambient air samples. The procedure was developed from
ARB Test Method NLB021,dated March 1988. The procedure measures both
benomyl and carbendazim as carbendazim. If both of these compounds are
present benomyl is converted to carbendazim prior to analysis. The method is
calibrated with benomyl standards that have been converted to carbendazim.

2.   SUMMARY OF METHOD

The exposed XAD-2 sorbent tubes are frozen until desorbed with 4 ml of
acetonitrile. The Injection volume is 100 µL. The reverse phase chromatographic
method employs an isocratic mobile phase and a silica C18 bonded stationary
phase with ultraviolet spectrometric detection at 280 nm.

3.   INTERFERENCES/LIMITATIONS

Method Interference may be caused by contaminants in solvents, reagents,
glassware or other processing apparatus that lead to discrete artifacts or
elevated baselines. A method blank must accompany all quantitation runs to
detect any possible method interference.

Matrix interference may be caused by ambient contaminants that extract from
the sample and coelute with carbendazim. The extent of matrix interference will
vary from source to source. Method development sampling from Sacramento
and Fresno counties found interference as high as 168 ng/m3.

4.   EQUIPMENT AND CONDITIONS

A. INSTRUMENTATION

Dionex DX-500 Ion Chromatograph
Dell OptiPlex G1, PC
Dionex AD 20 Absorbance Detector
DionexGP 50 Gradient Pump
DionexLC 20 Chromatography Enclosure
EPSON LQ – 950 Printer
Column: Waters u Bondapak C18 , 3.9 mm x 30 cm.
Guard column: Phenomenex Security Guard, phenylpropyl insert.
Pump: Isocratic at 1.0 ml/min
Detector: 280 nm

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Auto Sampler:
Vial type – 0.5 mL
Setup – injection type = loop
Injection mode = proportional
Bleed = on
inj/vial = 1

B.   AUXILIARY APPARATUS:

1. Sample shaker/desorber with timer, Branson 1200.
2. Kimble 8 ml desorption vials, teflon screw caps.
3. Dionex 0.5 ml autosampler vials.
4. Whatman 0.45 um PTFE syringe filter units.
5. Disposable syringes, 3 ml.

C.   REAGENTS

1. HPLC grade methanol
2. HPLC grade acetonitrile.
3. HPLC Mobile Phase -- Dissolve 4.1 g of sodium acetate in 550 mL of HPLC-grade water. Add 50 mL glacial acetic acid. Mix thoroughly. Add 400 mL of HPLC-grade acetonitrile and mix thoroughly.
4. Benomyl, 99% purity, CAS # 17804-35-2 from Chem Service, Inc.
5. Carbendazim, 99% purity, CAS # 10605-21-7 from Chem Service, Inc.
6. Benomyl, 100 ug/ml in methanol, from Ultra Scientific Inc.
7. Carbendazim, 100 ug/ml in methanol, from Ultra Scientific Inc.

5.   ANALYSIS OF SAMPLES

5.1   The field samples are collected on XAD-2 sorbent air sample tubes (SKC 226-30-06) which are stored in a freezer after exposure and before desorption.

5.2   Remove the glass wool plug from the primary end of the XAD-2 tube with a forceps and place it into an 8 mL desorbing vial. Pour the primary XAD-2 resin bed into the vial and add 4.0 mL of acetonitrile. Retain the secondary section of the XAD-2 tube resin bed for later analyses.

5.3   Place the desorbing vial into the sonicator for 1 hr. Filter the acetonitrile extract through a 0.45 micrometer filter into a clean 8 ml desorption vial. Sample extracts must be held at least 8 hours prior to analysis, to allow complete conversion of benomly to carbendazim.

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5.4 Establish HPLC operating parameters by using the Peak Net software to load the benomyl method. When baseline is stable the IC is ready to analyze samples.

5.5 A.100 ug/ml stock standard is prepared methanol. Working calibration standards are prepared at 1000, 500, 250, 125 and 62.5 ng/ml by diluting the stock standard in acetonitrile. Working standards must be held for a minimum of 8 hrs before use, to allow comlpete conversion of benomyl to carbendazim.

5.6 Each sample batch will include the following: a set of 5 calibration standards, a reagent blank, a XAD-2 resin blank, a 250 ng/ml benomyl control solution, a 250 ng/ml carbendazim control solution, a 250 ng lab resin spike and a 2000 ng lab resin spike. A 250 ng/ml standard check sample is analyzed following each batch of 10 field samples. Check standards must be within 20% of their target value. Control solutions must meet their quality control criteria.

5.7 The autosampler is setup by pouring 0.5 ml of sample into 0.5 ml sample vials and loading the vials into sample carriers in the same order as the sample schedule. Autosampler parameters are not set automatically when the method is loaded, so they must be checked before a sample run is started.

5.8 Method calibration is automatically updated and sample results are given in ng/ml units. Atmospheric concentration is calculated according to:

Conc., ng/m^3 = (Extract Conc., ng/ml X 4.0 ml) /Air Volume Sampled, m^3

6. QUALITY ASSURANCE

A. INSTRUMENT REPRODUCIBILITY

Five injections of benomyl standards at three concentrations are made in order to establish the reproducibility of this instrument. This data (Evaluation Section lab, 12/28/99) is shown in Table 1 of the attached report.

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Standard Operating Procedure for the Determination of Benomyl as Its Breakdown Product, Carbendazim, In Ambient Air

B. CALIBRATION

A linear regression was performed, using a linear curve fit, on a 62.5 ng/ml to 1000 ng/ml 5-point calibration curve made on 12/23/99.

$$Amt = 0.002915*Resp + 8.572$$

$$R^2 = 0.9992$$

C. CALIBRATION CHECK

A calibration check sample is run after every tenth field sample to verify system calibration. Calibration check samples must be within 20% of the assigned value. If the check sample is out of range then the ten samples within that sample batch will be reanalyzed.

D. MINIMUM DETECTION LIMIT

Detection Limit is based on USEPA MDL calculation. Using the analysis of seven replicates of a low level matrix spikes, the minimum detection limit (MDL), and the estimated quantitation limit (EQL) for benomyl were calculated by:

$$MDL = 3.14*s$$

$$EQL = 5*MDL$$

where: s = the standard deviation of the concentration calculated for the seven replicate spikes. Given s = 2.7ng/mL for the seven samples, the MDL and EQL are calculated as follows.

$$MDL = 3.14 \ (2.7 \ ng/mL) \ (4ml/sample) ≡ 34 \ ng/sample$$

$$EQL = 5 \ (34 \ ng/sample) = 170 \ ng/sample$$

Based on the 4.0 mL extraction volume and assuming a sample volume of 3.6 m^3 (2.5 lpm for 24 hours) the EQL for ambient concentration of benomyl is:

$$(170 \ ng) \ / \ (3.6 \ m^3) = 47 \ ng/m^3 \ per \ 24\text{-hour sample}$$

E. Extraction Efficiency

Extraction efficiency is established by extracting and analyzing spiked XAD-2 resin tubes that are not exposed to field sampling conditions. Three replicates at

two levels are extracted with the average and standard deviation determined for
the replicates. The average amount divided by the amount added multiplied by
100 gives the percent recovery.

	250 ng spike	2000 ng spike
	121.2	1783
	125.6	1502
	125.6	1578
Average	124.1	1621
Std. Dev.	2.54	145
Recovery	50 %	81 %

F.   Collection Efficiency

Collection efficiency is established by extracting and analyzing a spiked
filter that has been exposed to field sampling conditions. Three replicates
at two levels are extracted with the average and standard deviation
determined for the replicates. The average amount divided by the amount
added multiplied by 100 gives the percent recovery.

	250 ng spike	2000 ng spike
	224.2	1999
	347.0	2082
	272.2	1983
Average	281.1	2021
Std. Dev.	62	53
Recovery	112 %	101 %

G.   Storage Stability

A storage stability study is conducted over an 8 week period. Tubes (three each)
are spiked with benomyl at a low and high level. The spiked tubes are stored in
the freezer at -20^{0}C and extracted/analyzed on storage weeks 0, 2,4 and 8.
Results of this study can be found in section 2.6 of the attached report.

H.   Breakthrough

The primary resin bed of three XAD-2 resin tubes are each spiked with 2000 ng
of benomyl. The resin tubes are placed in a sampler and exposed to field
sampling conditions (2.5 lpm) for 24 hrs. The tubes are removed from the
sampler and both primary and secondary resin beds are analyzed for benomyl.
The primary resin beds had an average sample recovery of 68%. Benomyl was
not detected in any of the secondary resin beds.

7.   SAFETY

The toxicity and carcinogenicity of each reagent used in this method has not
been precisely defined. Therefore, each chemical compound must be treated as
a potential health hazard. Exposure to these chemicals must be reduced to the
lowest possible level. Material safety data sheets (MSDS's) should be on file for
all analytes and reagents.

APPENDIX III

n-BUTYL ISOCYANATE LABORATORY REPORT

California Environmental Protection Agency

⊖≡Air Resources Board

n-Butyl Isocyanate Method Development and n-Butyl Isocyanate Analytical
Results for Ambient Monitoring and Application Samples

Evaluation Section
Engineering and Laboratory Branch
Monitoring and Laboratory Division

DATE: March 24, 2000

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Project Numbers: C99-108 and C99-108A

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1.0 INTRODUCTION

The Department of Pesticide Regulation (DPR) requested the Air Resources Board (ARB) to develop an air sampling and analysis method and conduct ambient air and application site monitoring for benomyl and it's breakdown product, n-butyl isocyanate. ARB staff collected and analyzed ambient air and application site samples. This report covers method development, analytical results, and quality assurance results for the breakdown product, n-butyl isocyanate. The method estimated quantitation limit (EQL) is 0.10 µg/ml. The final n-butyl isocyanate (BIC) standard operating procedure (SOP) is attached as Appendix 1.

2.0 METHOD DEVELOPMENT AND STANDARD OPERATING PROCEDURE.

2.1 Overview

The method uses XAD-2 sorbent tubes for sample collection. Collected samples are extracted by sonication using 3 ml of dichloromethane (DCM). Analysis is performed using high-resolution gas chromatography/mass spectrometry in the selective ion-monitoring mode to maximize sensitivity. The results are reported as µg/ml of BIC based on a calibration range of 0.10 to 1.00 µg/ml.

2.2 Instrument Reproducibility

Five injections of 1 µl each were made of BIC standards at three concentrations in order to establish the reproducibility of this instrument (Table 1.)

2.3 Calibration

The instrument was calibrated using 0.10 - 1.00 µg/ml standards to produce a 5-point calibration curve with an average r^2 = 0.998 before each analytical sample batch.

2.4. Minimum Detection Limit (MDL)

The method follows standard United States Environmental Protection Agency (USEPA) procedures to calculate the MDL. Using the analysis of seven low level matrix spikes (0.10 µg/ml), the MDL and EQL for a 3 ml extract is calculated by:

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s = the standard deviation of the concentration calculated for the seven replicate spikes. For butyl isocyanate s = 0.007 µg/ml

$$MDL = (3.14)*(s) = (3.14)*(0.007) = 0.02 \text{ µg/ml.}$$
$$EQL = (5)*(MDL) = (5)*(0.02) = 0.10 \text{ µg/ml}$$

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Results above the EQL are reported to two (2) significant figures. Results below the EQL but greater than or equal to the MDL are reported as detected (DET). Results less than MDL are reported as <MDL.

2.5. Collection and Extraction Efficiency (Recovery)

Six (6) XAD-2 sample tubes were used to determine method recovery. The primary section of three (3) sample tubes were spiked with 0.1 µg of BIC standard and three (3) others with 1.0 µg. The spiked tubes were then subjected to an airflow of 30 mlpm for 24 hours at ambient temperature. The primary section of the spiked tubes were extracted with DCM and sonicated for 1 hour. The extracts were filtered and analyzed. The results are presented below.

BIC Spike	Mean Percent Recovery	RSD
0.1 µg	96.7%	5.8%
1.0 µg	86.3%	2.9%

2.6. Storage Stability

Staff spiked the primary sections of three (3) tubes with BIC at 0.10 µg and three (3) tubes at 1.0 µg for each week of storage. The spiked tubes were stored in the freezer and extracted/analyzed on storage weeks 0, 2, 5 and 6. The storage recoveries (average results) are shown below.

6 week Storage Stability Study (Percent storage recoveries)		
Week	0.1 µg	1.0 µg
0	100%	90%
2	90%	73%
5	70%	76%
6	60%	64%

2.7. Breakthrough

The primary sections of two tubes were spiked with 100 µg/tube, then run for 24 hours at 30 mlpm. Recoveries were 91.6% for the primary section and analysis of the back-up resin bed detected 1.0 µg BIC. The sampling for BIC is very flow dependent (see SOP).

3.0   BUTYL ISOCYANATE AMBIENT AIR MONITORING SAMPLE RESULTS.

Extraction and analysis of all samples was complete within 7 days of receipt.

The laboratory received a total of 160 ambient and QA samples for analysis from 02/07/00 to 03/20/00.   These include six (6) trip blanks (one for each week of monitoring), four (4)

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trip spikes, four (4) field spikes and four (4) laboratory spikes.

Table 2 presents the results of the analysis of the BIC ambient samples.

4.0 AMBIENT ANALYTICAL QUALITY CONTROL

4.1 Laboratory solvent blanks

A laboratory solvent blank, which is the DCM for extraction and preparation of the standards, is analyzed with each of the ambient BIC analytical sample batches. Staff defines a batch as the samples in an automated GC/MS analysis sequence. This is to insure there are no reagent interferences in the analysis. All blanks were less than the MDL.

4.2 Laboratory control blanks

A laboratory control blank is analyzed with each sample set. The blank XAD cartridge is prepared and analyzed as described for the ambient samples. No BIC was detected above the MDL.

4.3 Laboratory control spikes

A laboratory control spike is analyzed with each set of samples. A control spike is a resin tube spiked with 0.20 μg of BIC. The control sample is prepared and analyzed as described for the samples. The recoveries averaged 0.18 μg/sample, with a standard deviation of 0.02.

4.4 Calibration check samples

A calibration check sample is run after the calibration and every tenth sample in an analysis batch. Upper and lower control limits for the checks were based on ± 3 standard deviations of the historical data determined during method development. Graph 1 shows the calibration checks for all the ambient analyses completed. If any of the checks were outside the limits, the samples falling within the checks were re-analyzed.

5.0 AMBIENT FIELD, TRIP, AND LABORATORY SPIKES AND TRIP BLANKS

Four (4) laboratory spikes, four (4) trip spikes and four (4) field spikes were analyzed for the ambient BIC testing. All of the spikes were prepared at 0.20 μg/ml of BIC on 01/31/00.

5.1 Laboratory spikes

Four (4) tubes were spiked with 0.20 μg of BIC and stored in the freezer until analysis. The laboratory spike results are in Table 3. The average recovery was 0.14 μg, with a

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standard deviation of 0.01.

5.2   Trip spikes

Four (4) tubes were spiked with 0.20 μg/ml of BIC. The trip spike results are in Table 4.
The average recovery was 0.14 μg/ml, with a standard deviation of 0.01.

5.3   Field spikes

Four (4) tubes were spiked with 0.20 μg/ml of BIC. These were placed on a sampler at
the sampling site. The field spike results are in Table 5. The average recovery of the field
spikes was 0.17 μg/ml with a standard deviation of 0.02.

5.4   Trip blanks

Six (6) trip blanks were collected, one for each week of ambient monitoring (Table 6).

6.0   BUTYL ISOCYANATE APPLICATION SAMPLE RESULTS.

6.1   Application Samples

The laboratory received one hundred (100) application samples on 03/01/00, along with
four (4) field spikes, four (4) trip spikes, four (4) laboratory spikes, one (1) trip blank and
one (1) field blank. Analysis was complete on 03/22/00. Table 7 presents the results of
the analysis of the BIC application samples.

7.0   APPLICATION ANALYTICAL QUALITY CONTROL

7.1   Laboratory solvent blanks

A laboratory solvent blank of DCM is run with each analytical sample batch. BIC was not
present or detected in the solvent blanks.

7.2   Laboratory control blanks

A laboratory control blank is run with each analytical sample set. A blank XAD sample
tube is prepared and analyzed in the same manner as the samples. No BIC was detected
in the blanks.

7.3   Laboratory control spikes

Each sample set included a laboratory control spike at 0.20 μg/ml. The control spike is
prepared and analyzed in the same way as the samples. The recoveries averaged 0.18
μg/ml with a standard deviation of 0.02

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7.4 Calibration check samples

A calibration check sample is run after the calibration and every tenth sample in an analysis batch. Upper and lower control limits for the checks were based on ± 3 standard deviations of the historical data determined during method development. Graph 2 shows the calibration checks for all the application analyzes completed. If any of the checks were outside the limits, the samples falling within the checks were re-analyzed.

8.0 APPLICATION FIELD, TRIP, AND LABORATORY SPIKES AND TRIP BLANKS

Four (4) laboratory spikes, four (4) trip spikes and four (4) field spikes were analyzed for the BIC application test. The spikes were prepared at 0.20 µg/ml on 02/17/00. The analysis of all samples was completed on 03/22/00.

8.1 Laboratory spikes

Four (4) laboratory spikes were stored in the freezer until analysis. The average recovery was 0.12 µg/ml. See Table 8.

8.2 Trip spikes

Four (4) trip spikes accompanied samples to the sampling site. These trip spikes returned to the laboratory along with the samples. The average recovery was 0.11 µg/ml. See Table 9.

8.3 Field spikes

Four (4) field spikes were sent to the sampling site. The field spikes are treated in the same manner as a standard sample. The average recovery of the field spikes was 0.11 µg/ml. See Table 10.

8.4 Trip and field blanks

One (1) application trip blank and one (1) field blank was analyzed. BIC was less than the MDL.

9.0 DISCUSSION

The analytical method and analysis of the butyl isocyanate appears to be an adequate method. The low results of the application spikes were surprising, especially in view of the excellent results from the ambient analysis. It is possible the tubes were not spiked accurately, although the results from some of the tubes would indicate that they were. The same spiking solution was used throughout the whole analysis. All of the XAD spikes run with each sample set were from the same solution and results were >85.0% recovery. The balance of the quality controls run, particularly the calibration checks would indicate

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that the analysis ran accordingly. An analysis of the secondary bed for the application field spikes was less than MDL, indicating no breakthrough.

No specific analytical duplicates were made. However, the application samples that were DET, were re-analyzed either at the end of the run or in the next sample set analyzed to confirm the results.

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TABLE 1: Instrument Reproducibility

Amount BIC μg/ml	Response	Average/Std Dev.
0.10	379	
	371	
	385	
	345	
	375	371.11/15.43
0.40	1452	
	1430	
	1491	
	1489	
	1464	1465.20/25.72
1.00	3740	
	3631	
	3603	
	3974	
	3584	3706.40/161.32

Table 2. Ambient Air Monitoring Results

Log i.d.	Sample Name	Analysis Date	Sample Amount (μg/ml)	Log i.d.	Sample Name	Analysis Date	Sample Amount (μg/ml)
1	SCH1	02/11/00	<MDL	26	PLA4	02/14/00	<MDL
2	PLA1	02/11/00	<MDL	27	SCH4	02/14/00	<MDL
3	HOW1	02/11/00	<MDL	28	HOW4	02/14/00	<MDL
4	RIV1	02/11/00	<MDL	29	RIV4	02/14/00	<MDL
5	ARB1	02/11/00	<MDL	30	ARB4	02/14/00	<MDL
6	FS-1	02/11/00	0.14	31	ARB5	02/16/00	<MDL
7	FS-2	02/11/00	0.18	32	PLA5	02/16/00	<MDL
8	PLA2	02/11/00	<MDL	33	SCH5	02/16/00	<MDL
9	SCH2	02/11/00	<MDL	34	HOW5	02/16/00	<MDL
10	HOW2	02/11/00	<MDL	35	RIV5	02/16/00	<MDL
11	RIV2	02/11/00	<MDL	36	ARB6	02/16/00	<MDL
12	ARB2	02/11/00	<MDL	37	PLA6	02/16/00	<MDL
13	FS-3	02/11/00	0.18	38	SCH6	02/16/00	<MDL
14	FS-4	02/11/00	0.18	39	HOW6	02/16/00	<MDL
15	PLA3	02/11/00	<MDL	40	RIV6	02/16/00	<MDL
16	PLA3D	02/14/00	<MDL	41	ARB7	02/17/00	<MDL
17	SCH3	02/14/00	<MDL	42	ARB7D	02/17/00	<MDL
18	SCH3D	02/14/00	<MDL	43	PLA7	02/17/00	<MDL
19	HOW3	02/14/00	<MDL	44	PLA7D	02/17/00	<MDL
20	HOW3D	02/14/00	<MDL	45	SCH7	02/17/00	<MDL
21	RIV3	02/14/00	<MDL	46	SCH7D	02/17/00	<MDL
22	RIV3D	02/14/00	<MDL	47	HOW7	02/17/00	<MDL
23	BLANK	02/14/00	<MDL	48	HOW7D	02/17/00	<MDL
24	ARB3	02/14/00	<MDL	49	RIV7	02/17/00	<MDL
25	ARB3D	02/14/00	<MDL	50	RIV7D	02/17/00	<MDL

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Log i.d.	Sample Name	Analysis Date	Sample Amount (µg/ml)
51	ARB8	02/17/00	<MDL
52	PLA8	02/17/00	<MDL
53	SCH8	02/17/00	<MDL
54	HOW8	02/17/00	<MDL
55	RIV8	02/17/00	<MDL
56	BLANK	02/17/00	<MDL
57	ARB9	02/23/00	<MDL
58	PLA9	02/23/00	<MDL
59	SCH9	02/23/00	<MDL
60	HOW9	02/23/00	<MDL
61	RIV9	02/23/00	<MDL
62	ARB10	02/23/00	<MDL
63	PLA10	02/23/00	<MDL
64	SCH10	02/23/00	<MDL
65	HOW10	02/23/00	<MDL
66	RIV10	02/23/00	<MDL
67	ARB11	02/23/00	<MDL
68	ARB11D	02/23/00	<MDL
69	PLA11	02/23/00	<MDL
70	PLA11D	02/23/00	<MDL
71	SCH11	02/23/00	<MDL
72	SCH11D	02/23/00	<MDL
73	H0W11	02/23/00	<MDL
74	HOW11D	02/23/00	<MDL
75	RIV11	02/23/00	<MDL
76	RIV11D	02/23/00	<MDL
77	ARB12	02/23/00	<MDL

Log i.d.	Sample Name	Analysis Date	Sample Amount (µg/ml)
78	PLA12	02/23/00	<MDL
79	SCH12	02/23/00	<MDL
80	HOW12	02/23/00	<MDL
81	RIV12	02/23/00	<MDL
82	BLANK	02/23/00	<MDL
83	ARB13	03/01/00	<MDL
84	PLA13	03/01/00	<MDL
85	SCH13	03/01/00	<MDL
86	HOW13	03/01/00	<MDL
87	RIV13	03/01/00	<MDL
88	ARB14	03/01/00	<MDL
89	PLA14	03/01/00	<MDL
90	SCH14	03/01/00	<MDL
91	HOW14	03/01/00	<MDL
92	RIV14	03/01/00	<MDL
93	ARB15	03/01/00	<MDL
94	ARB15D	03/01/00	<MDL
95	PLA15	03/01/00	<MDL
96	PLA15D	03/01/00	<MDL
97	SCH15	03/01/00	<MDL
98	SCH15D	03/01/00	<MDL
99	HOW15	03/01/00	<MDL
100	HOW15D	03/01/00	<MDL
101	RIV15	03/01/00	<MDL
102	RIV15D	03/01/00	<MDL
103	ARB16	03/01/00	<MDL
104	PLA16	03/01/00	<MDL

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Log i.d.	Sample Name	Analysis Date	Sample Amount (μg/ml)
105	SCH16	03/01/00	<MDL
106	HOW16	03/01/00	<MDL
107	RIV16	03/01/00	<MDL
108	BLANK	03/01/00	<MDL
109	ARB17	03/08/00	<MDL
110	PLA17	03/08/00	<MDL
111	SCH17	03/08/00	<MDL
112	HOW17	03/08/00	<MDL
113	RIV17	03/08/00	<MDL
114	ARB18	03/08/00	<MDL
115	PLA18	03/08/00	<MDL
116	SCH18	03/08/00	<MDL
117	HOW18	03/08/00	<MDL
118	RIV18	03/08/00	<MDL
119	ARB19	03/08/00	<MDL
120	ARB19D	03/08/00	<MDL
121	PLA19	03/08/00	<MDL
122	PLA19D	03/08/00	<MDL
123	SCH19	03/08/00	<MDL
124	SCH19D	03/08/00	<MDL
125	HOW19	03/08/00	<MDL
126	HOW19D	03/08/00	<MDL
127	RIV19	03/08/00	<MDL
128	RIV19D	03/08/00	NA
129	ARB20	03/08/00	<MDL
130	PLA20	03/08/00	<MDL
131	SCH20	03/08/00	<MDL

Log i.d.	Sample Name	Analysis Date	Sample Amount (μg/ml)
132	HOW20	03/08/00	<MDL
133	RIV20	03/08/00	<MDL
134	BLANK	03/08/00	NA
135	ARB21	03/16/00	<MDL
136	PLA21	03/16/00	<MDL
137	SCH21	03/16/00	<MDL
138	HOW21	03/16/00	<MDL
139	RIV21	03/16/00	<MDL
140	ARB22	03/16/00	<MDL
141	PLA22	03/16/00	<MDL
142	SCH22	03/16/00	NA
143	HOW22	03/16/00	<MDL
144	RIV22	03/16/00	<MDL
145	ARB23	03/16/00	<MDL
146	ARB23D	03/16/00	<MDL
147	PLA23	03/16/00	<MDL
148	PLA23D	03/16/00	<MDL
149	SCH23	03/16/00	<MDL
150	SCH23D	03/16/00	<MDL
151	HOW23	03/16/00	<MDL
152	HOW23D	03/16/00	<MDL
153	RIV23	03/16/00	<MDL
154	RIV23D	03/16/00	<MDL
155	ARB24	03/16/00	<MDL
156	PLA24	03/16/00	<MDL
157	SCH24	03/16/00	<MDL
158	HOW24	03/16/00	<MDL

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Log i.d.	Sample Name	Analysis Date	Sample Amount (µg/ml)
159	RIV24	03/16/00	<MDL
160	BLANK	03/16/00	<MDL

Table 2 Notes: Ambient Air Monitoring

The following samples were not analyzed (NA):
Sample RIV19D#128 and Blank#134: the tube broke during preparation for analysis.
Sample SCH22#142: lost the sample on filtering transfer.
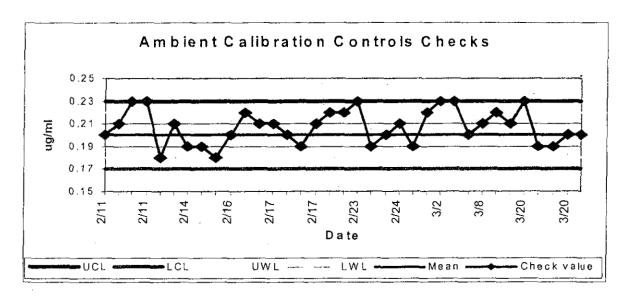
If analysis result is $\geq$ MDL and < EQL it is reported in the table as detected (DET). Levels $\geq$ EQL of 0.10 µg/sample are reported as the actual measured value and are reported to two significant figures.

<MDL = BIC less than 0.02 µg/ml
 Det = BIC amount $\geq$ 0.02 µg/ml (MDL) and <0.10 µg/ml (EQL).

Site location i.d.:
SCH: Schelby School
PLA: Plainsburg School
HOW: Howard School
ARB: ARB in Fresno
RIV: Riverview School

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Graph 1: Calibration Check Sample Results (Ambient)

Ambient Calibration Controls Checks

y-axis: ug/ml (0.15, 0.17, 0.19, 0.21, 0.23, 0.25)

x-axis: Date (2/11, 2/11, 2/14, 2/16, 2/17, 2/17, 2/23, 2/24, 3/2, 3/8, 3/20, 3/20)

Legend: UCL — LCL — UWL — LWL — Mean — Check value

Graph 2: Calibration Check Sample Results (Application)

Application Calibration Control Checks

y-axis: ug/ml (0.15, 0.17, 0.19, 0.21, 0.23, 0.25)

x-axis: Date (3/7, 3/7, 3/9, 3/9, 3/13, 3/13, 3/21, 3/21, 3/21, 3/22, 3/22)

Legend: UCL — UWL — Mean — LWL — LCL — Check Value

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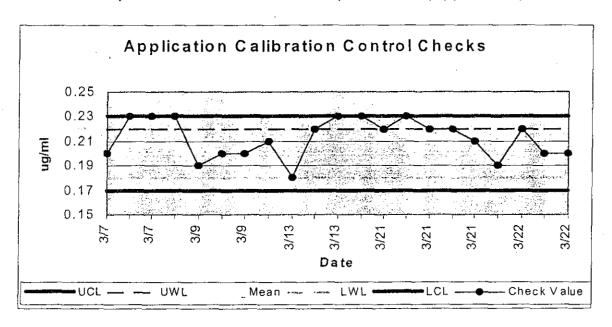
Table 3: Laboratory Spike Results

Sample #	Date Spiked	Date Analyzed	BIC (μg/ml)	Percent Recovery
LS-1	01/31/00	02/16/00	0.16	80.0
LS-2	01/31/00	02/14/00	0.13	65.0
LS-3	01/31/00	02/16/00	0.14	70.0
LS-4	01/31/00	02/17/00	0.13	65.0

Table 4: Trip Spike Results

Sample #	Date Spiked	Date Analyzed	BIC (μg/ml)	Percent Recovery
TS-1	01/31/00	02/11/00	0.16	80.0
TS-2	01/31/00	02/14/00	0.14	70.0
TS-3	01/31/00	02/16/00	0.14	70.0
TS-4	01/31/00	02/17/00	0.13	65.0

Table 5: Field Spike Results

Sample #	Date Spiked	Date Analyzed	BIC (μg/ml)	Percent Recovery
FS-1	01/31/00	02/11/00	0.14	70.0
FS-2	01/31/00	02/11/00	0.18	90.0
FS-3	01/31/00	02/11/00	0.18	90.0
FS-4	01/31/00	02/11/00	0.18	90.0

Table 6: Trip Blank Results

Sample Name	Date Analyzed	BIC (μg/ml)
Blank#23	02/14/00	<MDL
Blank#56	02/17/00	<MDL
Blank#82	02/24/00	<MDL
Blank#108	03/01/00	<MDL
Blank#134	03/08/00	NA
Blank#160	03/20/00	<MDL

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Table 7: Application Monitoring Results

Log #	Sample Name	Analysis Date	Results ng/ml
1	BG1W	03/07/00	<MDL
2	BG2N	03/07/00	<MDL
3	BG3E	03/07/00	<MDL
4	BG4S	03/07/00	<MDL
5	FS1W	03/07/00	0.10
6	FS2W	03/07/00	0.11
7	FS3E	03/07/00	0.11
8	FS4E	03/07/00	0.10
9	BW1	03/07/00	<MDL
10	BW21	03/07/00	<MDL
11	BE1	03/07/00	<MDL
12	BS21	03/07/00	<MDL
13	BS31	03/07/00	<MDL
14	BS11	03/07/00	<MDL
15	BN31	03/07/00	<MDL
16	BN11	03/07/00	<MDL
17	BED1	03/07/00	<MDL
18	BS12	03/09/00	<MDL
19	BS22	03/09/00	<MDL
20	BS32	03/09/00	<MDL
21	BS42	03/09/00	<MDL
22	BN12	03/09/00	<MDL
23	BN22	03/09/00	<MDL
24	BN2D2	03/09/00	<MDL
25	BN32	03/09/00	<MDL

Log #	Sample Name	Analysis Date	Results ng/ml
26	BN42	03/09/00	<MDL
27	BS13	03/09/00	<MDL
28	BS23	03/09/00	<MDL
29	BS33	03/09/00	<MDL
30	BS43	03/09/00	<MDL
31	BN13	03/09/00	<MDL
32	BN23	03/09/00	<MDL
33	BN2D3	03/09/00	<MDL
34	BN33	03/09/00	<MDL
35	BN43	03/09/00	<MDL
36	BS14	03/13/00	<MDL
37	BS24	03/13/00	<MDL
38	BS34	03/13/00	<MDL
39	BS44	03/13/00	<MDL
40	BN14	03/13/00	<MDL
41	BN24	03/13/00	<MDL
42	BN2D4	03/13/00	<MDL
43	BN34	03/13/00	<MDL
44	BN44	03/13/00	<MDL
45	BS15	03/13/00	<MDL
46	BS25	03/13/00	<MDL
47	BS35	03/13/00	<MDL
48	BS45	03/13/00	<MDL
49	BN15	03/13/00	<MDL
50	BN25	03/13/00	<MDL

Log #	Sample Name	Analysis Date	Results ng/ml
51	BN2D5	03/13/00	<MDL
52	BN35	03/13/00	<MDL
53	BN45	03/13/00	<MDL
54	BS16	03/15/00*	<MDL
55	BS26	03/15/00	<MDL
56	BS36	03/15/00	<MDL
57	BS46	03/15/00	<MDL
58	BN16	03/15/00	<MDL
59	BN26	03/15/00	<MDL
60	BN2D6	03/15/00	<MDL
61	BN36	03/15/00	<MDL
62	BN46	03/15/00	<MDL
63	BS17	03/15/00	<MDL
64	BS27	03/15/00	<MDL
65	BS37	03/15/00	DET
66	BS47	03/15/00	DET
67	BN17	03/15/00	<MDL
68	BN27	03/15/00	<MDL
69	BN2D7	03/15/00	DET
70	BN37	03/15/00	DET
71	BN47	03/15/00	<MDL
72	BS18	03/21/00	<MDL
73	BS28	03/21/00	<MDL
74	BS38	03/21/00	<MDL
75	BS48	03/21/00	<MDL

* Analysis of 03/15 were reanalyzed on 03/22.

Log #	Sample Name	Analysis Date	Results ng/ml
76	BN18	03/21/00	<MDL
77	BN28	03/21/00	<MDL
78	BN2D8	03/21/00	<MDL
79	BN38	03/21/00	<MDL
80	BN48	03/21/00	<MDL
81	BS19	03/21/00	<MDL
82	BS29	03/21/00	<MDL
83	BS39	03/21/00	<MDL
84	BS49	03/21/00	<MDL
85	BN19	03/21/00	<MDL
86	BN29	03/21/00	DET
87	BN2D9	03/21/00	DET
88	BN39	03/21/00	<MDL
89	BN49	03/21/00	<MDL
90	BS110	03/21/00	<MDL
91	BS210	03/21/00	<MDL
92	BS310	03/21/00	<MDL
93	BS410	03/21/00	<MDL
94	BN110	03/21/00	<MDL
95	BN210	03/21/00	<MDL
96	BN2D10	03/21/00	<MDL
97	BN310	03/21/00	<MDL
98	BN410	03/21/00	<MDL
99	BFBLANK	03/21/00	<MDL
100	BTBLANK	03/21/00	<MDL

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Table 7 Notes: Application Air Monitoring Results

Application samples were received on 03/06/00. Sample analysis was completed by 03/22/00.

If analysis result is $\geq$ MDL and < EQL it is reported in the table as detected (DET). Levels $\geq$ EQL of 0.10 µg/sample are reported as the actual measured value and are reported to two significant figures.

<MDL = BIC less than 0.02 µg/ml
 Det = BIC amount $\geq$ 0.02 µg/ml (MDL) and <0.10 µg/ml (EQL).

Table 8: Laboratory Spikes Results

Sample	Date Analyzed	BIC (µg/ml)	Percent Recovery
LS-1	03/07/00	0.14	70.0%
LS-2	03/09/00	0.08	40.0%
LS-3	03/13/00	0.10	50.0%
LS-4	03/15/00	0.15	75.0%

Table 9: Trip Spike Results

Sample	Date Analyzed	BIC (µg/ml)	Percent Recovery
TS-1	03/07/00	0.15	75.0%
TS-2	03/09/00	0.08	40.0%
TS-3	03/13/00	0.03	15.0%
TS-4	03/15/00	0.17	85.0%

Table 10: Field Spike Results

Sample	Date Analyzed	BIC (µg/ml)	Percent Recovery
FS1W	03/07/00	0.10	50.0%
FS2W	03/07/00	0.11	55.0%
FS3E	03/07/00	0.11	55.0%
FS4E	03/07/00	0.10	50.0%

Table 11: Blank Resin Results

Sample	BIC µg/ml
BFBlank	<MDL
BTBlank	<MDL

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California Environmental Protection Agency

⬤≡ Air Resources Board

Standard Operating Procedure
Sampling and Analysis of n-Butyl Isocyanate
in Ambient Air

Evaluation Section
Engineering and Laboratory Branch
Monitoring and Laboratory Division

03/02/00 version

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1. SCOPE

This is a gas chromatographic/mass spectrometric method for the determination of n-butyl isocyanate from ambient and application air sampling in conjunction with the use of benomyl.

2. SUMMARY OF METHOD

The ambient and application samples are collected on XAD-2 resin cartridges with a flow rate of 30 milliliters per minute (mlpm). The samples are stored in an ice chest on dry ice or in a freezer until ready for analysis. The XAD is extracted with dichloromethane (DCM) and placed in a sonicator. The extraction solvent is filtered and the aliquot placed in a vial for analysis. The split injection volume is 1 μl. A gas chromatograph with a capillary column (5% phenyl - methylpolysiloxane phase) and a quadrapole mass spectrometer (MS) is used for analysis. The MS detector is operated in selective ion monitoring mode.

3. INTERFERENCES/LIMITATIONS

A method blank is run with each batch of samples to detect any possible method interference. Contaminants in solvents, reagents, glassware and other processing apparatus may cause interference including discrete artifacts or elevated baselines. Co-eluting compounds trapped during sample collection may also interfere.

4. EQUIPMENT AND CONDITIONS

A. Instrumentation

Hewlett Packard 6890 Series Plus chromatograph
Hewlett Packard 5973 mass selective detector
Hewlett Packard 7683 Autosampler

Detector: 280°C
Injector: 225°C
Injector Liner: 4 mm straight liner with glass wool
Column: J&W DB-5MS, 30 meter, 0.25 mm i.d., 0.25 μm film thickness.
GC Temp. Program: Initial 40°C, hold 0.5 min., to 100°C @ 10°C/min, to 240° @30 °C/min, hold 8.0 min.

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Injector:
Pressure Initial 8.8 psi constant flow mode
Split: 10:1
Carrier Gas: Helium
Column: Linear velocity: 38 cm/sec, electronic pressure control (8.8 psi @ 50 °C).
Auto Sampler:
Sample washes - 2, Sample pumps - 6, Sample Volume - 1 stops,
Viscosity delay - 1 sec, Solvent A washes - 2, Solvent B washes - 2
Mass Spectrometer:
Electron Ionization
Selective Ion Monitoring; n-butyl isocyanate, 56 (quant. ion, 100%), 98 (qual. ion, 20%), 70 (qual. ion, 20%). Tuning: PFTBA on masses 69, 219, 502.

B. Auxiliary Apparatus

1. Precleaned Vials (7 ml) with teflon lined caps
2. Filters, Whatman 0.45 μm
3. Disposable syringes, 3 ml
4. Sonicator
5. GC vials with septum caps

C. Reagents

1. Dichloromethane, Pesticide Grade or better
2. n-Butyl isocyanate, 98% pure or better (from Aldrich).
3. XAD-2 tubes, (from SKC, Inc. Fullerton, Ca. #226-30-06)

5. ANALYSIS OF SAMPLES

1. A daily manual tune shall be performed using PFTBA. The instrument is tuned using masses - 69, 219, 502. The criterion for the tune are the peak widths at 1/2 the peak height, 0.50 $\pm$ .05, and the criteria for relative abundance; 69:100%; 219:100%-120%, and 502:7%-12%.

2. It is necessary to analyze a solvent blank with each batch of samples. The blank must be free of interferences. A solvent blank must be analyzed after any sample results in possible carry-over contamination.

3. A 5- point calibration curve shall be analyzed with each batch of samples.

4. With each batch of samples analyzed a laboratory blank and a laboratory control spike will be run concurrently. A laboratory blank is resin prepared and analyzed the same way the samples are analyzed. A laboratory control spike is resin spiked with a known amount of standard. The control sample is prepared and analyzed the same way as the samples. Laboratory check samples should have recoveries that are at least 70% of the theoretical spiked value.

5. A calibration check sample of 0.20 µg/ml is run after the calibration and for every 10 samples and at the end. The value of the check must be within ± 3σ (the standard deviation) of the analyses from historical data. If the calibration check is outside the limit then those samples in the batch after the last calibration check that was within the limit need to be reanalyzed.

6. Score and snap the sample tube, transfer the XAD resin into a 7ml vial. (Save the back-up bed for future analysis if necessary.) Rinse the tube with 3.0 ml of DCM into the extraction vial. Cap and place the vial in the sonicator for 1 hour.

7. Filter the samples using a 3 ml syringe and 0.45 µm filter directly into a gc vial.

8. The atmospheric concentration is calculated according to:

Conc., µg/m³ = (Extract Conc., µg/ml X 3.0 ml) /Air Volume Sampled, m³

6. **QUALITY ASSURANCE**

A. Instrument Reproducibility

Establish the reproducibility of the instrument and analytical method as follows. Inject five 1 µl injections of n-butyl isocyanate standard at three concentrations (low, mid and high range). Table 1 shows the instrument reproducibility for 0.10 µg, 0.40 µg, and 1.00 µg with the average and standard deviation of the determined value and the area response.

B. Calibration

A 5-point calibration to determine the best fit for the method quantitation is used over the range 0.1 to 1.0 µg/ml. The regression is linear over this range with r^2 = 1.0.

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C. Calibration Check

A calibration check sample is run after the calibration and then every tenth sample in a batch to verify the system is still in calibration. Calibration check samples must be within ± 3σ of the assigned value. If the check sample is outside that range then the ten samples within that sample batch will be rerun.

D. Minimum Detection Limit

Detection Limit is based on US EPA MDL calculation. Using the analysis of seven replicates of a low-level matrix spike, the method detection limit (MDL), and the estimated quantitation limit (EQL) for BIC is calculated by: MDL = 3.14*(stdev values) where: stdev = the standard deviation of the concentration calculated for the seven replicate spikes. For butyl isocyanate, the MDL is 0.02 µg/ml. EQL defined as 5 *MDL is 0.10 µg/ml based on a 3 ml extract. Results are reported to 2 significant figures above the EQL. Results less than EQL but greater than MDL are reported as detect (DET). Results less than the MDL are reported as less than MDL (<MDL).

E. Collection and Extraction Efficiency (Recovery)

Butyl isocyanate at a low and high level are spiked on XAD tubes (3 at each concentration). The spiked tubes are placed on field samplers with airflows of 30 mlpm for 24 hours. The samples are extracted with DCM and prepared as described in section 5 #6-7. The average percent recoveries of BIC should be ± 20% of the expected value. The recoveries both for the low and high levels are greater than 85%.

Amount Spiked	% Recovery	% RSD
0.1 µg	96.67	5.77
1.0 µg	86.33	2.89

The critical factor for maintaining a high recovery is the airflow of the samplers. The recovery at 500 mlpm averaged 33%, with 10% appearing in the backup resin definite indication that the BIC is coming off at the higher flows.

F. Storage Stability

Conduct a storage stability study of BIC over a 6-8 week period. The tubes are spiked with BIC at a low and high level, three (3) each plus a blank for each week of the analysis. The spiked tubes are stored in the freezer at -20°C and optimally extracted/analyzed on storage weeks 0, 2, 4 and 6.

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G. Breakthrough

Two tubes are spiked with BIC at a high level (100 µg). The tubes are placed on the sampler for 24 hours at 30 mlpm . Each tube, front and back bed, is then extracted/analyzed for BIC to determine if it is going through into the second bed.

Air Flow	%Recovery	
	Front	Back
30 mlpm	91.6	1.0
100 mlpm	34.4	10.0
500 mlpm	30.0	10.0
2.5 lpm	24.0	<1.0

H. Safety

This procedure does not address all of the safety concerns associated with chemical analysis. It is the responsibility of the analyst to establish appropriate safety and health practices. For hazard information and guidance refer to the material safety data sheets (MSDS) of any chemicals used in this procedure.

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Table 1: Instrument Reproducibility

	0.1	μg/ml	Response	0.4	μg/ml	Response	1.0	μg/ml	Response
		0.08	379		0.38	1452		1.01	3740
		0.08	371		0.38	1430		0.98	3631
		0.09	385		0.39	1491		0.98	3603
		0.07	345		0.39	1489		1.08	3974
		0.08	375		0.38	1464		0.97	3584
Avg		0.08	371		0.38	1465		1.00	3706
Std		0.01	15		0.01	26		0.05	161

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APPENDIX IV

DPR's USE INFORMATION AND MONITORING RECOMMENDATIONS FOR BENOMYL

Department of Pesticide Regulation

MEMORANDUM

TO: Cindy Castronovo
        Air Resources Board
        Monitoring and Lab Division
        1900 14th Street
        Sacramento, California 95814

FROM: Randy Segawa, Senior Environmental Research Scientist *Segawa*
        Environmental Monitoring and
          Pest Management Branch

DATE: November 23, 1999

SUBJECT: RECOMMENDATION FOR BENOMYL MONITORING FOR THE TOXIC
         AIR CONTAMINANT PROGRAM

Enclosed is the staff recommendation for benomyl monitoring in 2000. We have revised the target limit of quantitation since our informal recommendation. We now request that you try to achieve a limit of quantitation of 0.05 micrograms per cubic meter for benomyl (as the carbendazim breakdown product), and a limit of quantitation of 8 micrograms per cubic meter for n-butylisocyanate.

We have made some informal inquiries about anticipated benomyl use for 2000. No significant changes in use patterns are expected at this time. However, as with most fungicides, benomyl use can change rapidly with weather conditions.

Good luck on the monitoring. Feel free to contact Pam Wales, of my staff, at (916) 324-3877, or me at (916) 324-4137, if you have any questions.

Enclosure

cc: Pam Wales
    Lynn Baker

Staff Report

Use Information and Air Monitoring Recommendation for the Pesticide Active Ingredient Benomyl

November 1999

By
Pamela Wales
Environmental Research Scientist

California Department of Pesticide Regulation
Environmental Monitoring and
Pest Management Branch

ENVIRONMENTAL HAZARDS ASSESSMENT PROGRAM

USE INFORMATION AND AIR MONITORING RECOMMENDATION FOR THE PESTICIDE ACTIVE INGREDIENT BENOMYL

A. BACKGROUND

This recommendation contains general information regarding the physical-chemical properties and the historical uses of benomyl. The Department of Pesticide Regulation (DPR) provides this information to assist the Air Resources Board (ARB) in their selection of appropriate locations for conducting pesticide air monitoring operations.

Table 1 describes some of the physical-chemical properties of benomyl.

Table 1. Some Physical-Chemical Properties of Benomyl

Chemical name	Methyl 1-(butylcarbamoyl)-2-benzimidazolecarbamate
Common name	Benomyl
Some tradenames[†]	Benlate (du Pont),
CAS number	17804-35-2
Molecular formula	$C_{14}H_{18}N_4O_3$
Molecular weight	290.3
Form	Colorless or white crystals with faint acrid odor (Montgomery, 1997; Tomlin, 1994)
Solubility	Water: 2.8 mg/L at 25°C (stable only at pH7) (Montgomery, 1997)
Vapor pressure	3.73×10^{-8} mmHg at 25°C (Kollman and Segawa, 1995)
Henry's Law Constant	5.1×10^{-9} atm-m³/mole at 25°C (calculated)
Soil adsorption Coefficient (Kd)	3.96×10^{1} g/cm³ C (Kollman and Segawa, 1995)
Aerobic soil metabolism half-life	7.92×10^{-1} day (Kollman and Segawa, 1995)
Anaerobic soil metabolism half-life	1.00 day (Kollman and Segawa, 1995)

In all environmental compartments, benomyl (figure 1a) decomposes by loss of the butylcarbamoyl group to form the relatively stable, strongly fungicidal methyl 2-benzimidazolecarbamate, also known as carbendazim (figure 1b) (Tomlin, 1994). In soil and water, benomyl rapidly converts to carbendazim and 2-aminobenzimidazole (Montgomery, 1997). Benomyl residues are relatively immobile in organic soils, and were detected only in the top four inches. At least two strains of fungi and four strains of bacteria demonstrated the ability to degrade benomyl to nonfungicidal compounds in loamy soils (Helweg, 1972).

[†] Disclaimer: The mention of commercial products, their source, or their use in connection with material reported herein is not to be construed as either an actual or implied endorsement of such products.

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Figure 1. The Chemical Structures of Benomyl, Carbendazim, and n-Butyl Isocyanate

(a) Benomyl   (b) Carbendazim

$$O{=}C{=}N{-}C_4H_9$$

(c) Butyl isocyanate

In laboratory studies under simulated greenhouse conditions with temperatures ranging from 25°C to 40°C, benomyl decomposed to equimolar amounts of carbendazim and butyl isocyanate (BIC) (figure 1c) when mixed with water and introduced over a layer of basaltic gravel growing medium (Tang et al., 1993; Tang et al., 1992). BIC readily volatilized and was detected in the vapor phase, regardless of formulation. As temperature increased, the rate of BIC formation was enhanced in the early hours following application, especially when the dry flowable formulation was used (Tang, 1993). In a greenhouse study, BIC was detected in air samples collected from sealed glass dishes containing aqueous benomyl suspensions (Aragaki et al., 1994). Airborne concentrations of BIC would likely be lower under field conditions because of the dilution of open air (Tang, 1993).

Benomyl has an LC_{50} (96 hour) of 0.17 mg/L for rainbow trout, and 4.2 mg/L for goldfish. It is nontoxic to bees, with an oral and contact $LD_{50} > 10\mu g/bee$ (Tomlin, 1994).

B.   USE OF BENOMYL

As of November 1999, two products containing benomyl were registered for use in California. Of the two benomyl products, one is registered for home-garden use, and one product is registered for agricultural use.

Benomyl is a systemic, benzamidazole fungicide that is selectively toxic to microorganisms and invertebrates. It is used to treat a wide range of fungal diseases in field crops, fruit and nut crops, and ornamentals.

In California's agricultural setting, growers primarily use benomyl to control brown rot blossom blight in almonds; botrytis bunch rot, anthracnose, and isarcopsis leaf spot in grapes; and brown rot blossom blight, powdery mildew, and cherry leaf spot in stone fruits. Benomyl recommended label use rates range from 0.5 to 6 pounds per active acre. The benomyl product label recommends use

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rates of 3 pounds active ingredient per acre for almonds, and 6 pounds per acre in grapes, stone fruits, and citrus. For almond and stone fruit crops, the label specifies that two applications are necessary for complete control; the first application should be applied at pink bud or popcorn stage, followed by a second application at full bloom stage 10 days later. For grapes, the label specifies application should occur at first bloom, followed by a second application fourteen days later. For all crops, the label specifies that benomyl should not be applied alone, but should be used only in combination or in an alternating application program with a nonbenzimidazole fungicide.

The benomyl product label offers several methods for application, including: chemigation (including center pivot, lateral move, end tow, side wheel roll, traveler, big gun, solid set, or hand move irrigation systems) on beans, carrots, celery, cucurbits, strawberries and tomatoes; air blast field crop sprayers; and air blast tree and vine sprayers. Benomyl is available as a wettable powder and includes the Signal Words "Caution" on the label.

With DPR's implementation of full pesticide use reporting in 1990, all users must report the agricultural use of any pesticide to their county agricultural commissioner, who subsequently forwards this information to DPR. DPR compiles and publishes the use information in the annual Pesticide Use Report (PUR). Because of California's broad definition for agricultural use, DPR includes data from pesticide applications to parks, golf courses, cemeteries, rangeland, pastures, and rights-of-way, postharvest applications of pesticides to agricultural commodities, and all pesticides used in poultry and fish production, and some livestock applications in the PUR. DPR does not collect use information for home and garden use, or for most industrial and institutional uses. The information included in this monitoring recommendation reflects widespread cropland applications of benomyl. Use rates were calculated by dividing the total pounds of benomyl used (where benomyl was applied to acreage) by the total number of acres treated.

According to the PUR, the total amount of benomyl used in California from 1990 to 1998 has ranged annually between slightly more than 114,000 to over 536,000 pounds (Table 2). The majority of California's total benomyl use occurred in five counties—Kern, Madera, Fresno, Tulare, and Merced. Although the annual amounts of benomyl used in the five counties have varied widely since 1991, the use patterns have varied little.

In California, growers use benomyl primarily to control brown rot blossom blight on almonds and stone fruits, and botrytis bunch rots in grapes (Table 3). Treatments usually are made in the late winter and early spring (Table 4). The use of benomyl is difficult to predict as disease pressure is depended on weather and other factors, such as cultural practices. However, assuming that no significant changes in weather will occur next year, the use of benomyl is not expected to change.

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Table 2. **Annual Cropland Use of Benomyl by County (Pounds of Active Ingredient)**

County	1990	1991	1992	1993	1994	1995	1996	1997	1998
Kern	7,899	4,225	10,596	8,782	16,625	29,616	15,595	17,375	56,911
Madera	11,357	7,658	9,119	309,825	12,311	15,434	21,659	15,189	38,100
Fresno	30,366	21,884	26,077	31,199	30,412	33,190	15,691	12,902	25,827
Tulare	19,796	17,937	18,685	19,804	20,074	26,675	11,993	9,248	20,977
Merced	6,220	4,896	4,458	4,769	9,372	13,232	16,416	13,779	19,520
Stanislaus	2,615	2,313	803	2,063	3,210	6,227	10,099	3,621	8,232
Ventura	6,851	7,100	10,301	106,771	5,928	9,318	7,257	6,159	7,642
Mendocino	2,163	1,393	1,743	2,781	1,421	2,616	2,266	3,184	5,068
Lake	273	69	30	619	306	1,998	1,075	1,442	4,604
Monterey	10,832	8,687	5,716	7,268	5,864	4,157	3,372	3,247	3,874
Santa Barbara	4,331	3,335	2,662	2,248	2,094	3,978	4,289	3,070	3,678
San Joaquin	4,455	2,425	1,332	1,811	3,058	1,227	1,874	1,707	3,551
Sacramento	3,213	901	768	593	32	501	603	1,273	3,430
Orange	3,408	2,093	3,050	405	1,243	2,095	1,139	1,512	2,497
Yolo	2,298	1,201	883	1,472	592	1,492	988	846	2,339
Total for Top 15 Counties	116,079	86,118	96,222	500,410	112,539	151,755	114,317	94,555	206,249
Percent of CA Total	69	74	77	93	79	80	77	83	91
Total Statewide Use	168,564	116,961	125,777	536,594	141,586	189,943	148,433	114,406	227,728

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Table 3. **Annual Cropland Use of Benomyl by Commodity (Pounds of Active Ingredient)**

Crop	1990	1991	1992	1993	1994	1995	1996	1997	1998
Grapes	42,011	28,622	39,024	329,547	28,806	47,338	24,748	24,977	78,363
Almond	30,213	13,504	21,139	51,847	55,550	57,297	69,373	45,102	62,489
Tomatoes	1,016	415	319	316	837	944	587	1,166	61,082
All Other Nut Crops	526	409	589	1,367	1,909	10,843	10,029	6,234	38,279
Pome Fruit Crops	3,166	3,188	2,085	4,152	1,901	5,686	4,989	6,256	15,196
Small Fruits and Berries	66,979	8,752	11,465	9,314	7,860	12,212	8,952	9,394	11,763
Stone Fruit Crops	35,447	32,223	37,626	42,224	37,781	37,651	14,930	6,321	7,921
Celery	8,697	10,134	19,117	133,147	8,530	10,215	9,875	9,369	7,657
All Other Crop Uses	10,122	5,568	9,126	6,422	7,075	12,128	6,106	6,548	7,262
Citrus Fruits	97	82	12	39	19	19	52	2,058	5,839
Greenhouse/Nursery	24,838	16,418	4,358	1,626	929	480	381	674	670
All Non-Crop Uses	11,043	4,485	1,202	927	778	1,341	284	118	154
Total	234,156	123,799	146,063	580,927	151,974	196,154	150,305	118,217	296,675

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Table 4.   Annual Monthly Use of Benomyl (Pounds of Active Ingredient)
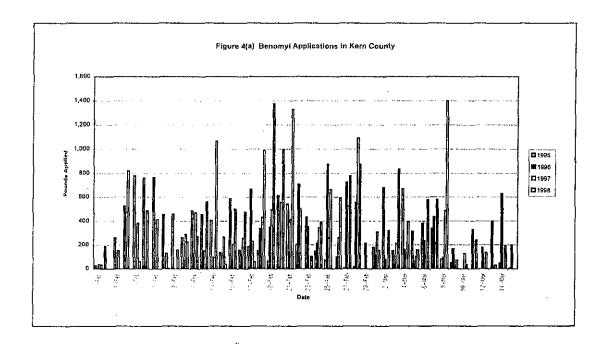
Month	1990	1991	1992	1993	1994	1995	1996	1997	1998
January	6,800	5,394	4,265	53,585	4,167	5,813	4,629	7,454	6,769
February	16,277	33,978	45,231	52,649	41,140	81,617	48,318	44,260	49,896
March	54,057	20,477	17,053	71,784	42,888	26,630	39,262	14,165	32,143
April	12,009	2,331	15,934	311,825	11,664	24,441	22,545	19,452	59,739
May	30,368	19,659	16,220	22,355	22,696	33,665	18,591	12,052	51,450
June	13,534	7,545	9,740	7,842	4,763	5,513	4,057	2,988	14,969
July	8,128	5,326	6,863	4,405	3,820	2,421	1,506	2,403	3,409
August	9,720	6,446	3,274	3,519	2,380	1,838	1,568	2,320	2,047
September	6,165	5,458	1,622	2,047	1,885	1,432	1,664	1,663	2,153
October	4,653	4,368	1,830	2,131	2,303	1,780	1,996	1,445	1,825
November	3,870	3,508	1,831	1,791	1,894	1,593	1,629	1,580	1,252
December	2,983	2,472	1,913	2,659	1,987	3,199	2,669	4,622	2,076
Total	*168,564*	*116,961*	*125,777*	*536,594*	*141,586*	*189,943*	*148,433*	*114,406*	*227,728*
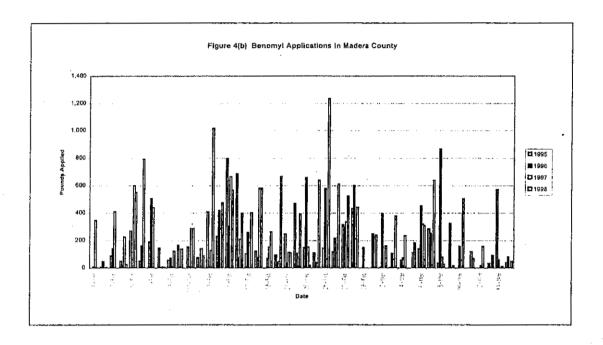
In Fresno, Kern, and Madera Counties, the predominant use has occurred consistently during the late winter and early spring, and was associated with applications to almonds. While this late winter peak occurred again in 1998, the period of peak use that year occurred during April in Madera and Kern Counties associated with applications to pistachios, and during May in Fresno County, associated with applications to grapes. Because the use in 1998 was inconsistent with past practices, and because 1999 PUR data is not yet available, it is difficult to predict if these April-May uses will regularly occur in future years.
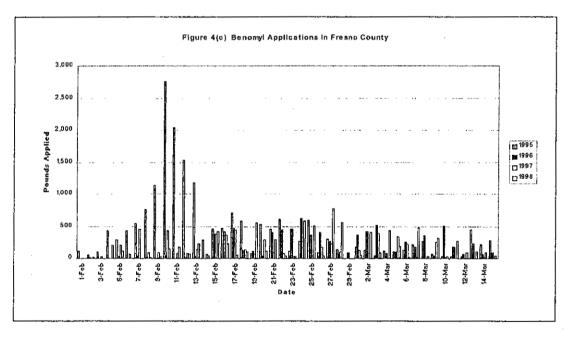
C.   RECOMMENDATIONS

1.   *Ambient Air Monitoring*

The historical trends in benomyl use suggest that monitoring should occur over a 30- to 45-day sampling period during the late winter in the Central Valley, in Fresno, Madera, or Kern Counties. Figure 4(a) shows Kern County's applications generally began in early February and tail off by mid-March. Alternatively, monitoring may be possible in Fresno or Madera Counties during the same period. Figures 5(a-e) display the areas of benomyl use by section in the Central Valley from 1994-1998, respectively. Three to five sampling sites should be selected in relatively high-population areas or in areas frequented by people (e.g., schools or school district offices, fire stations, or other public buildings). Samples should be collected and analyzed for benomyl (as carbendazim, if necessary) and BIC. Sampling sites should be located near almond growing areas. At each site, twenty to thirty discrete 24-hour samples should be taken during the sampling period. Background samples should be collected in an area distant to benomyl applications. Target 24-hour quantitation limits of at least $0.05 \ \mu g/m^3$ for benomyl (as carbendazim), and $8.1 \ \mu g/m^3$ for n-butyl isocyanate are recommended.

Figure 4(a) Benomyl Applications In Kern County

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Figure 4(b) Benomyl Applications In Madera County

Figure 4(c) Benomyl Applications In Fresno County

DPR recommends close coordination with the county agricultural commissioner to select the best sampling sites and periods. Replicate (collocated) samples are needed for five dates at each sampling location. In addition to the primary sampler, one collocated sampler should be run on those days. The date chosen for replicate samples should be distributed over the entire sampling period. They may, but need not be, the same dates at every site. Field spike samples should be collected at the same environmental conditions (e.g., temperature, humidity, exposure to sunlight)

and experimental conditions (e.g., air flow rates) as those occurring at the time of ambient sampling.

Additionally, we request that you provide in the ambient monitoring report: 1) the proximity of the sampler to treated or potentially treated fields, including the distance and direction, and 2) the distance the sampler is located above the ground.

2.   *Application-Site Air Monitoring*

The historical trends in benomyl use and product label information suggest that a typical agricultural application-site air monitoring study could be conducted in Fresno, Madera, or Kern County during the same months as the ambient study, in association with an application to grapes or almonds. The benomyl product labels offer several methods for application, including chemigation, and boom and air blast sprayers. DPR does not have a preference for the type of application method monitored. Ideally, monitoring should occur at a site using the highest allowed rates of use (i.e., about 6.0 pounds per acre), however, growers typically apply 1 pound per acre for almonds and stone fruits, and 1-2 pounds per acre for grapes. Rarely do applications exceed 3 pounds per acre.

DPR recommends close coordination with the county agricultural commissioner to select the best sampling sites and date. Again, samples should be collected and analyzed for benomyl (as carbendazim, if necessary) and BIC. Ideally, the monitoring study should include samples taken before, during, and for 72 hours following application, according to the following schedule:

Sample period begins:	Sample duration time
Background (pre-application)	Minimum 12 hours
During application	Length of application time
End of application	1 hour
1 hour post-application	2 hours
3 hours post-application[1]	3 hours (or up to 1 hour before sunset)
6 hours post-application[1]	6 hours (or up to 1 hour before sunset)
1 hour before sunset	Overnight[2] (until 1 hour after sunrise)
1 hour after sunrise	Daytime (until 1 hour before sunset)
1 hour before sunset	Overnight (until 1 hour after sunrise)
1 hour after sunrise	24-hour (until 1 hour after sunrise)

1 These samples and sample duration times may be adjusted depending on length of application time. The important issue is to take at least one 3-6 hour sample between the end of the 2-hour sample and dusk (one hour before sunset).

2 All overnight samples must include the period from one hour before sunset to one hour after sunrise.

Occasionally, a pesticide application may occur all day long over the course of two or more days. In these instances, please collect a sample during the daily application, and an overnight sample between the end of the daily application and the start of application the next morning. Following

the end of the application, begin collecting samples according to the above schedule, beginning with the 1-hour sample. Again, some sample time durations may be adjusted according to the time remaining between end of application and dusk. Regardless of application duration, the study should include at least one 1-hour sample taken immediately following the end of application, at least one 2-4 hour sample (taken following the 1-hour sample), and all overnight samples must include the time period from one hour before sunset to one hour following sunrise.
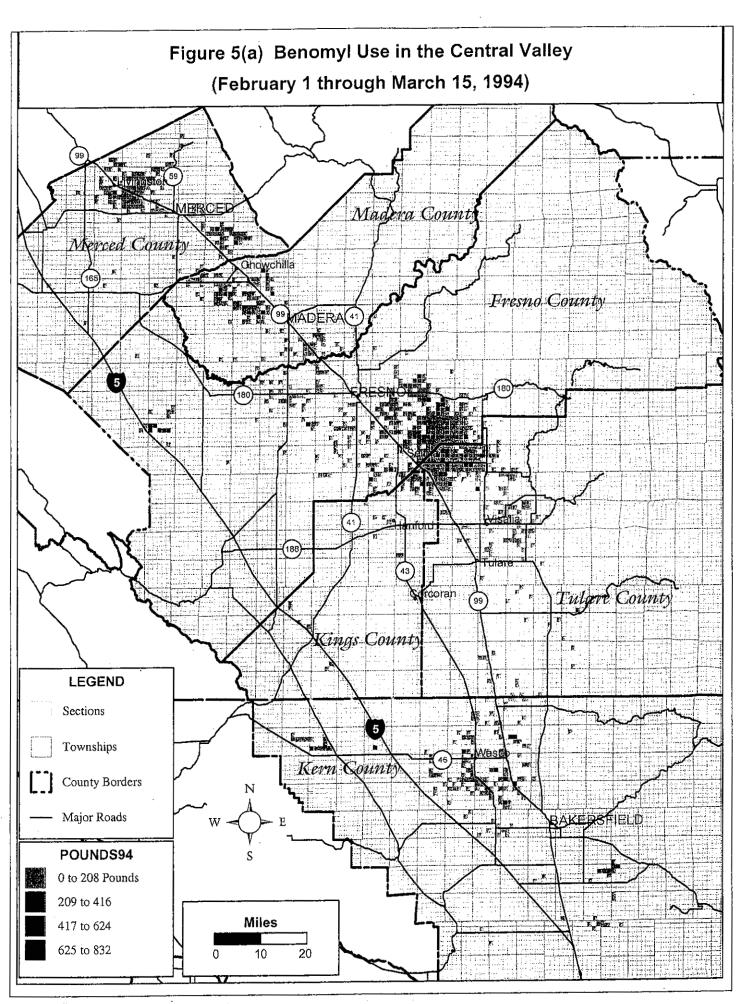
The selected field should be 10 acres in area, or larger. A minimum of four samplers should be positioned, one on each side of the field. A fifth sampler should be collocated at one position. Since benomyl is extensively used in the area, background samples should collect enough volume to achieve the recommended target 24-hour quantitation limit of at least 0.05 μg/m^3 for benomyl (as carbendazim), and 8.1 μg/m^3 for BIC. Ideally, samplers should be placed a minimum of 20 meters from the field. Field spike samples should be collected at the same environmental conditions (temperature humidity, exposure to sunlight) and experimental conditions (similar air flow rates) as those occurring at the time of sampling.
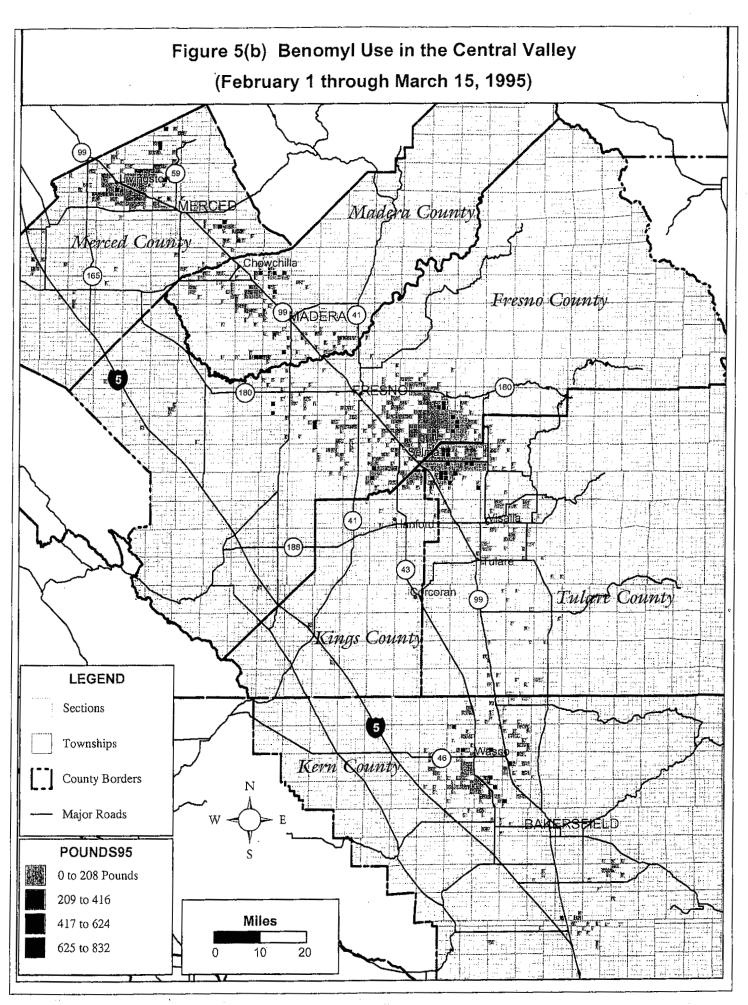
Additionally, we request that you provide in the monitoring report: 1) an accurate record of the positions of the monitoring equipment with respect to the field, including the exact distance that the sampler is positioned from the field; 2) an accurate drawing of the monitoring site showing the precise location of the meteorological equipment, trees, buildings, and other obstacles; 3) meteorological data collected at a minimum of 15-minute intervals including wind speed and direction, humidity, and air temperature, and comments regarding degree of cloud cover; and 4) the elevation of each sampling station with respect to the field, and the orientation of the field with respect to North (identified as either true or magnetic North).
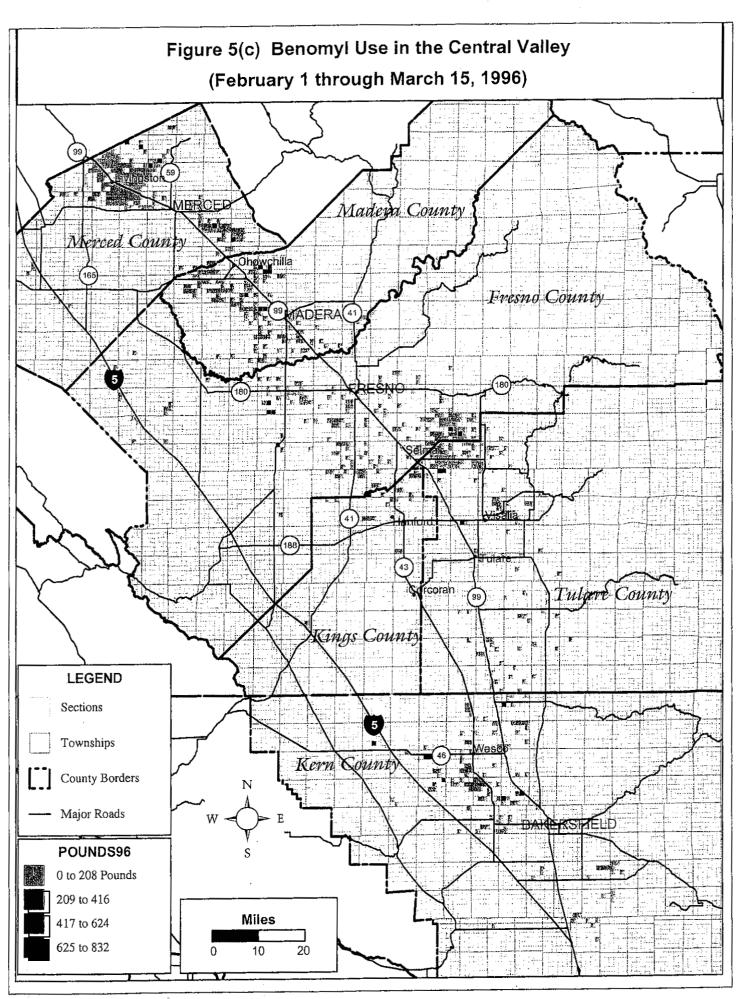
D.   SAFETY RECOMMENDATIONS
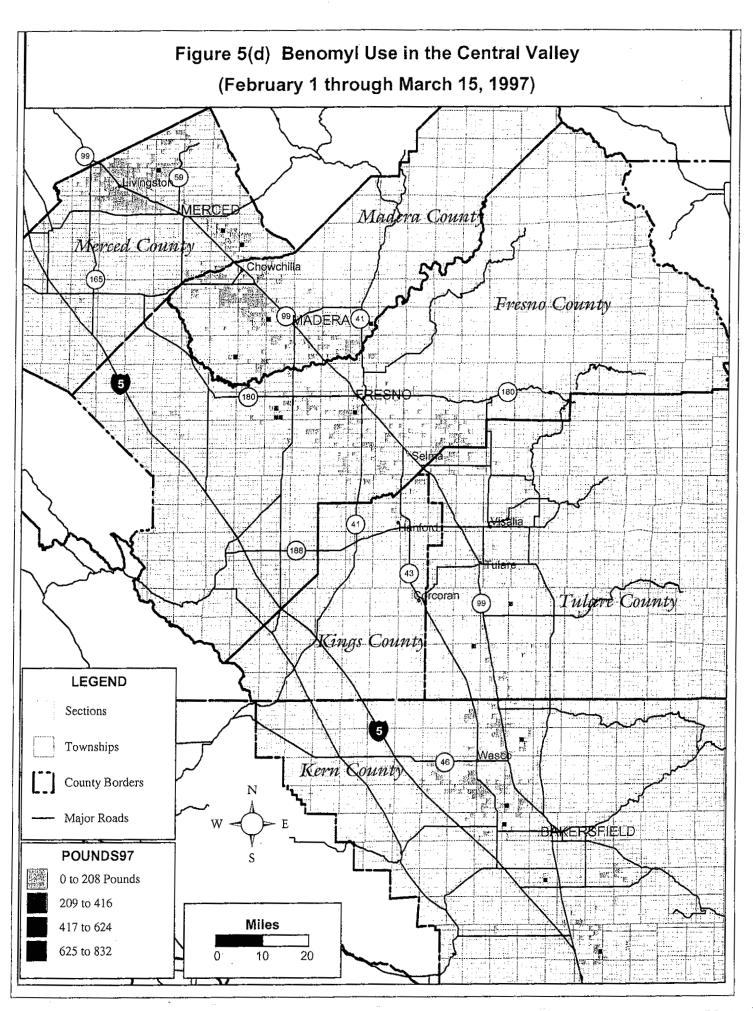
The benomyl product label warns that benomyl may irritate eyes, nose, throat, and skin. The label cautions that benomyl may cause a temporary allergic skin reaction in a few susceptible persons, which should be treated as an allergic dermatitis.
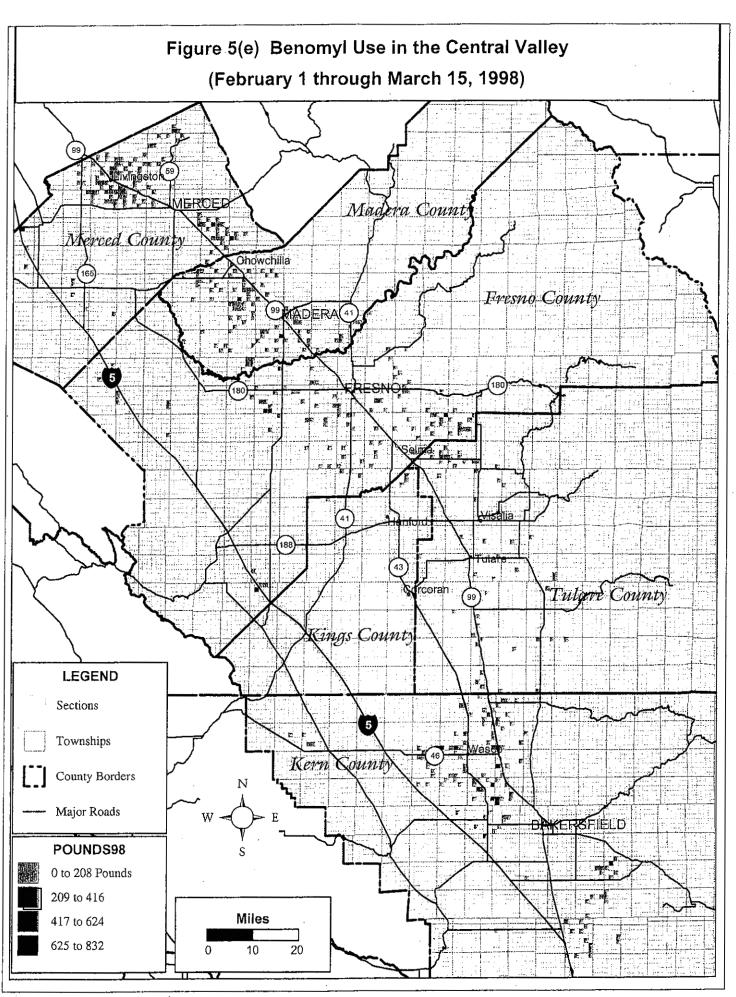
Monitoring personnel should use proper protective equipment to prevent exposure to the dust, vapors or spray mist. According to the product labels, proper protective equipment for applicators includes long-sleeved shirt and long pants, waterproof gloves and chemical-resistant footwear plus socks, and a dust/mist filtering respirator for outdoor exposures. Additional protective equipment includes a cartridge respirator equipped with a filter cartridge approved for use with pesticides, protective eyewear, and chemical-resistant headgear for overhead exposure. Monitoring personnel should refer to the label of the actual product used for further precautions.

Figure 5(a) Benomyl Use in the Central Valley
(February 1 through March 15, 1994)

LEGEND

Sections

Townships

County Borders

Major Roads

POUNDS94

0 to 208 Pounds

209 to 416

417 to 624

625 to 832

Miles

0   10   20

Figure 5(b) Benomyl Use in the Central Valley
(February 1 through March 15, 1995)

LEGEND

Sections

Townships

County Borders

Major Roads

POUNDS95

0 to 208 Pounds

209 to 416

417 to 624

625 to 832

Miles
0   10   20

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Figure 5(c) Benomyl Use in the Central Valley
(February 1 through March 15, 1996)

LEGEND

Sections

Townships

County Borders

Major Roads

POUNDS96

0 to 208 Pounds

209 to 416

417 to 624

625 to 832

Miles

0   10   20

Figure 5(d) Benomyl Use in the Central Valley
(February 1 through March 15, 1997)

LEGEND

Sections

Townships

County Borders

Major Roads

POUNDS97

0 to 208 Pounds

209 to 416

417 to 624

625 to 832

Miles

0   10   20

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Figure 5(e) Benomyl Use in the Central Valley
(February 1 through March 15, 1998)

LEGEND

Sections

Townships

County Borders

Major Roads

POUNDS98

0 to 208 Pounds

209 to 416

417 to 624

625 to 832

Miles

0   10   20

Merced County

Madera County

Fresno County

Kings County

Tulare County

Kern County

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E.   REFERENCES

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APPENDIX V

APPLICATION PESTICIDE USE RECOMMENDATION

PESTICIDE USE RECOMMENDATION
Helena Chemical Company
P.O. Box 305
Kerman, CA 93630
209-846-7383

Date: # 15781 02-24-00
Proposed: 02-24-00
Expires: 02-29-00
Completed: 02-29-00

Crop: ALMONDS
Area: 90 Acres
Del Tkt#:
PO#:
PCA: MIKE WILSON   4224
Pest. Permit#: 10-2000-10-30489
SITE: 302   NW/NE TRINITY/180
County#: CA10   Section: 4 -
Soil Texture: SANDY CLAY LOAM   Soil pH: 7

Grower: DAN & JOHN LUTZ
22 N. TRINITY
KERMAN, CA. 93630
(209) 846-9662

Acct#:
Applr: GROWER APPLIED
Fldmn: MIKE WILSON   4224
Township: 14 -   Range: 17 -   B&M: MD
Soil % Organic Matter: 1

###
Recommendation#: 15781   Proposed Treatment: 90 Acres

Material	REG.#	RATE	/100 gal	Band	Mat. Req.	Target Pest	
BENLATE SP	00352-00564-AA-00000	1.00 lbs /Treated Ac	1.00	No	90.00 lb.	BROWN ROT BLOSSOM BLIGHT	M*
CAPTAN 50 WETTABLE POWDER	51036-00166-AA-00000	6.00 lbs /Treated Ac	6.00	No	540.00 lb.	BROWN ROT TWIG BLIGHT	M*
COHERE	05905-50083-AA-00000	3.00 ozs / 100 Gal.	3.00	No	2.11 gal	*EXEMPT*	M*
CORON 28-0-0	*EXEMPT*	32.0 ozs /Broadct Ac	0.25	No	23 gal	*EXEMPT*	F

Apply by: GROUND   Gallons of Diluent/Treated Acre: 100
------------------------------- SPECIAL INSTRUCTIONS -------------------------
CAPTAN: APPLY AT POPCORN, BLOOM, PETAL FALL AND UP TO 5 WEEKS AFTER PETAL FALL.
 Mix with: DO NOT APPLY IN COMBINATION WITH OR IMMEDIATELY BEFORE OR CLOSELY
 FOLLOWING OIL SPRAYS.
############################### PRECAUTIONS ###############################
*Restricted: NO   Days to Harvest: 50
Chemical Category: I   DANGER   Avoid Drift
                                        Avoid Water Contamination
                                        Toxic to Fish
Non Re-entry Interval: 4.00 DAYS
Feed/Graze Treated Area/Crop: YES   Plantback Restriction: NO

Days to Pasture: 0
===

CRITERIA / ENVIRONMENTAL CHANGES	W	N	NE
1. APPLICATION MADE FOR PREVENTATIVE REASONS DELIVER TO TRINITY & 180			

REFER TO ATTACHMENT
ALMOND

The execution of this recommendation certifies that alternative and miti-
gation measures that would substantially lessen any significant adverse
impact on the environment have been considered and, if feasible, adopted.

| W | S | SE |

MIKE WILSON   4224 Signature: | Grower Signature:

Field: MWDJL302
Crop: ALMONDS
Grower: DAN & JOHN LUTZ

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PLANTBACK RESTRICTIONS or LIMITATIONS

BENLATE SP: DO NOT tank mix with lime or alkaline pesticides such as bordeaux mixture or lime sulfur. DO NOT tank mix or alternate with benzimidazole or thiophanate products. Apply as a spray using sufficient water to obtain thorough coverage of plants. Under severe disease conditions, use the higher treatment rate and shorter interval for repeat applications. Do not use on greenhouse crops, including hydroponically grown crops. Do not use on any container-grown crops or ornamentals. Use only in commercial or farm plantings. Not for use in home plantings nor once any commercial crop is turned into "U-Pick", "Pick Your Own" or similar operation. Repeated, exclusive use of BENLATE may lead to buildup of resistant strains of fungi and loss of disease control. **** Large mature trees will require the higher labeled rate. Apply at pink bud. If needed, repeat during half to full bloom or 10 days after initial application, whichever comes first. Do not use BENLATE alone in a spray program. Use only in combination or in an alternating application program with a labeled nonbenzimidazole fungicide. Under severe disease conditions or on disease-susceptible varieties, make a second application during half to full bloom.

CAPTAN: Do not apply or allow to drift to adjoining food, fiber or pasture crops. CAPTAN can be combined safely and effectively with most commonly used fungicides and insecticides, with the exception of oil and strongly alkaline materials. Do not apply CAPTAN in combination with or immediately before or closely following oil sprays. The time factor governing the safe interval between CAPTAN and oil sprays varies due to general climatic conditions, therefore, consult local agricultural spray programs and authorities to determine the proper timing. The use of spreaders which cause excessive wetting is not advised. Combinations with solvent formulations of organic phosphates should not be used. Combinations of CAPTAN and sulfur should not be used on crops sensitive to sulfur. Apply the high rate and spray at shorter intervals when climatic conditions most favor disease(s) and the low rate and/or spray at larger intervals when climatic conditions least favor disease(s). If you are unaware of the climatic conditions favorable for disease(s) claimed for the specific use sites, you must consult with your State Agricultural Extension Service to learn of these conditions. Begin applications before or at first sign of disease and repeat as needed to maintain control. Do not apply this product through any type of irrigation system. Drift of CAPTAN onto sensitive crops (e.g. D'Anjou pears) can cause phytotoxicity and crop loss. **** Use 6-10.5 lbs/acre when CAPTAN is used alone. To reduce the potential for disease resistance development to other fungicides having a similar spectrum, CAPTAN may be used in a tankmix at a rate of 4-6 lbs/acre at popcorn, bloom and petal fall stages and up to 5 weeks after petal fall. Hulls may be fed to livestock. Do not apply more than 52.5 lbs/acre per crop cycle (prebloom through postharvest). For control of anthracnose, use in a disease and resistance management program of rotational sprays with other approved materials.

COHERE: For use with products registered for: Agricultural, Forestry, Industrial, Municipal, Non-Cropland, Ornamental, Rights-Of-Way, Turf, Aquatic and other uses. The addition of an adjuvant to some pesticides or pesticide tank mix combinations may cause phytotoxicity to the foliage and/or fruit of susceptible crops. Prior to the addition of Cohere to spray tank mixes and/or prior to the application of Cohere with a pesticide and/or fertilizer where a spreader-sticker adjuvant is not specifically recommended but not prohibited by the product's label the user or application advisor must have experience with the combination under similar environmental and crop cultural conditions and/or have conducted a phytotoxicity trial under similar environmental and crop cultural conditions. Cohere may be applied by ground or aerial spray equipment. Cohere may be applied in concentrate or dilute sprays. In most applications, use enough Cohere to allow for uniform wetting and deposition of the spray onto leaf surfaces without undue runoff. Ground: Use 1/2-1 pt/100 gallons of total spray solution. Use sufficient spray for thorough coverage, or the amount of total spray solution recommended by the pesticide label(s). Do not use more than 10 ozs. per acre. Air: For maximum sticking effect, use 1-3 ounces of Cohere per 1-5 gallons of water per acre. For general application, use 1 to 2 pints per 100 gallons spray solution. Do not use more than 10 ozs. per acre. Note: The above use recommendations are considered to be adequate for most uses. Some pesticides may require higher or lower rates for optimum effect. Follow the pesticide label directions when this occurs. Order of addition to spray tank: Water (as specified by pesticide label(s). Add all pesticides or spray materials. Begin agitation. Add Cohere.

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APPENDIX VI

BENOMYL AMBIENT FIELD LOG SHEETS

SCH : Schelby School	ARB : ARB in Fresno	
PLA : Plainsburg School	RIV : Riverview School	
HOW : Howard School		

SAMPLE FIELD LOG SHEET
Project: Benomyl Ambient Air Monitoring
Project # : C99-108

Log #	Sample ID	Date On/Off	Time On/Off	Start Flow (LPM)	End Flow (LPm)	Start Leak Check	End Leak Check	Start ETM Count	End ETM Count	Comments	Weather o=overcast pc=partly c=cloudy k=clear	Initials
1	SCH 1	1-31-00 / 2-1-00	1100 A / 10.55	2.50	2.30	✓		0.73	24.51	Rotometer 5-5	c	NEL
2	PlA 1	1-31-00 / 2-1-00	1200 / 10:00 A	2.50	2.29	✓		0.61	22.62	Rotometer 5-9	c	PG
3	HOW 1	1-31-00 / 1-31-00	1:00 / 12:00 PM	2.50	2.48	✓		0.55	23.65	Rotometer 5-3	C	CE
4	RIV 1	1-31-00 / 2-1-00	2:10 / 1:15	2.50	2.38	✓		0.63	23.73	Rotometer 5-4	C	CC
5	ARB 1	1-31-00 / 2-1-00	3:00 / 2:00	2.50	2.54	✓		0.62	23.69	Rotometer 5-1	C	CC
6	FS1	1-31-00	3.00	2.5	2.39	✓		0.63		Rot 5-8	C	NEL
7	FS2	1-31-00	3 06 P	2.5	2.35	✓		0.63		ROT 5-T 3A	c	
8	FS3	1-31-00	3.00 P	2.5	2.51	✓		—		ROT 5-6	c	
9	PLA 2	2-1-00 / 2-2-00	10:00 / 10:00	2.5	2.45	✓		22.88	46.63	Rotometer 5-9	k	CE
10	SCH 2	2-1-00 / 2-2-00	10:55 / 10:45	2.5	2.41	✓		24.64	48.38	Rotometer 5-5	k	CC
11	HOW 2	2-1-00 / 2-2-00	12:00 / 11:50	2.5	2.38	✓		23.76	47.45	Rot 5-3	k	CC
12	RIV 2	2-1-00 / 2-2-00	1:20 / 1:00	2.5	2.44	✓		23.78	47.42	ROT 5-4	k	CC
13	ARB 2	2-1-00 / 2-2-00	2:05 / 1:45	2.5	2.44	✓		23.76	47.41	ROT 5-1	k	CC
14	FS 4	2-1-00 / 2-2-00	1430 / 1:55	2.5	2.35	✓		24.02	47.55	5-8	k	NEL
15	FS 5	2-1-00 / 2-2-00	1430 / 2:00	2.5	2.24	✓		24.02	47.65	3-A	k	
16	FS 6	2-1-00 / 2-2-00	1430 / 2:05	2.5	2.32	✓		24.02	47.65	5-6	k	

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SAMPLE FIELD LOG SHEET

Project: Benomyl Ambient Air Monitoring
Project # : C99-108

Log #	Sample ID	Date On/Off	Time On/Off	Start Flow (LPM)	End Flow (LPM)	Start Leak Check	End Leak Check	Start ETM Count	End ETM Count	Comments	Weather o=overcast pc=partly c=cloudy k=clear	Initials
17	PLA3	2-2-00 / 2-3-00	10:05 / 10:00	2.5	2.42	✓		46.73	70.64	ROT 5-9	k	CC
18	PLA 30	2-2-00 / 2-3-00	10:08 / 10:05	2.5	2.24	✓		46.77	70.73	ROT 1B	k	CC
19	SCH 3	2-2-00 / 2-3-00	10:50 / 10:45	2.5	2.6	✓		48.46	72.27	ROT 5-5	k	CC
20	SCH 30	2-2-00 / 2-3-00	10:55 / 10:45	2.5	2.32	✓		48.50	72.27	ROT 11B	k	CC
21	HOW3	2-2-00 / 2-3-00	11:55 / 11:50	2.5	2.5	✓		47.54	71.42	ROT 5-3	k	CC
22	HOW 30	2-2-00 / 2-3-00	11:58 / 11:50	2.5	2.19	✓		47.58	71.42	RoT 2B	k	CC
23	RIV3	2-2-00 / 2-3-00	1:00 / 1:05	2.5	2.44	✓		47.58	71.55	RoT 5-4	k	CC
24	RIV3D	2-2-00 / 2-3-00	1:02 / 1:05	2.5	2.38	V		47.52	71.55	RoT 5-10	k	CC
25	Blank	2-2-00 / 2-2-00	1:05 / 1:05								k	CC
26	ARB 3	2-2-00 / 2-3-00	1:50 / 2:00	25	2.23	✓		47.47	71.56	RoT 5-1	k	CC
27	ARB 3D	2-2-00 / 2-3-00	1:55 / 2:00	2.5	2.47	✓		47.51	71.56	ROT 5-8	k	CC
28	PLA4	2-3-00 / 2-4-00	10:05 / 10:05	2.5	2.45	V		70.70	94.68	RoT 5-9 Rained overnight moisture in sample	PC	CC
29	SCH 4	2-3-00 / 2-4-00	10:50 / 10:35	2.5	2.43	V		72.43	96.28	RoT 5-15 Rained overnight	PC	CC
30	HOW4	2-3-00 / 2-4-00	11:55 / 11:35	2.5	2.57	✓		71.48	95.24	Rot 5-3 Rained overnight	PC	CC
31	RIV 4	2-3-00 / 2-4-00	1:10 / 10:00 Am	2.5	2.52	✓		71.66	92.54	Rot 5-4	PC	CC
32	ARB 4	2-3-00 / 2-4-00	2:05 / 12:25	25	2.59	✓		71.69	94.08	Rot 5-1	PC	CC

SCH : Schelby School	ARB : ARB in Fresno
PLA : Plainsburg School	RIV : Riverview School
HOW : Howard School	

SAMPLE FIELD LOG SHEET

Project: Benomyl Ambient Air Monitoring

Project # : C99-108

Log #	Sample ID	Date On/Off	Time On/Off	Start Flow ( )	End Flow ( )	Start Leak Check	End Leak Check	Start ETM Count	End ETM Count	Comments	Weather o=overcast pc=partly c=cloudy k=clear	Initials
33	Arb 5	2-7-00 / 2-8-00	9:00 / 9:00	25	2.41	✓		167.72	186.80	Rot 5-1	k	P.G.
34	PLA 5	2-7-00 / 2-8-00	10:00 / 10:00	2.5	2.38	✓		94.71	118.87	Rot 5-7	k	CC
35	SCH 5	2-7-00 / 2-8-00	10:40 / 10:45	2.5	2.46	✓		168.22	192.38	Rot 118	k	CC
36	RIV 5	2-7-00 / 2-8-00	11:35 / 11:45	2.5	2.46	✓		167.17	191.26	Rot 23	k	CC
37	RIV 5	2-7-00 / 2-8-00	12:45 / 12:45	2.5	2.75	✓		92.54	116.55	Rot 5-4	k	CC
38	ARB 6	2-8-00 / 2-9-00	9:05 / 9:15	2.5	2.36	✓		186.85 / 464.85	210.89	Rot 5-1	CC	CC
39	PLA 6	2-8-00 / 2-9-00	10:15 / 10:30	2.5	2.29	✓		118.93	143.19	Rot 5-7	k	CC
40	SCH 6	2-8-00 / 2-9-00	10:50 / 11:00	2.5	2.28	✓		192.45	216.78	Rot 116	k	CC
41	HOW 6	2-8-00 / 2-9-00	11:50 / 12:15	2.5	2.28	✓		191.45	215.85	Rot 23	k	CC
42	RIV 6	2-8-00 / 2-9-00	12:56 / 1:25	2.5	2.41	✓		116.50	141.18	Rot 5-4	k	CC
43	ARB RIV 7	2-9-00 / 2-10-00	9:20 / 9:05	2.5	0.98	✓		210.99	234.73	Rot 5-1 Water in sample/water in Rotometer/ I think it leaks	O	CC
44	ARB RIV 7D	2-9-00 / 2-10-00	9:23 / 9:05	2.5	2.65	✓		216.04	234.76	Rot 5-8	O	CC
45	PLA 7	2-9-00 / 2-10-00	10:35 / 10:20	2.5	2.40	✓		143.25	167.03	Rot 5-7	O	CC
46	PLA 7D	2-9-00 / 2-10-00	10:38 / 10:20	2.5	2.44	✓		143.29	167.08	Rot 13	O	CC
47	SCH 7	2-9-00 / 2-10-00	11:15 / 11:00	2.5	2.51	✓		216.85	240.61	Rot 113	O	CC
48	SCH 7D	2-9-00 / 2-10-00	11:20 / 11:00	2.5	2.49	✓		216.90	240.63	Rot 5-5	O	CC

SAMPLE FIELD LOG SHEET

Project: Benomyl Ambient Air Monitoring
Project #: C99-108

SCH : Schelby School   ARB : ARB in Fresno
PLA : Plainsburg School   RIV : Riverview School
HOW : Howard School

Log #	Sample ID	Date On/Off	Time On/Off	Start Flow (LPM)(L/min)	End Flow (L/min)	Start Leak Check	End Leak Check	Start ETM Count	End ETM Count	Comments	Weather (o=overcast, pc=partly cloudy, c=cloudy, k=clear)	Initials
49	How 7	2-9-00	12:15	2.5	2.45	V		215.91	239.65	Rot 2-3	o	
50	How 70	2-9-00	12:05 / 12:18	2.5	2.5	V		215.95	239.72	Rot 5-3	o	
51	RIV 7	2-9-00 / 2-10-00	1:30 / 1:10	2.5	2.52	V		191.24	165.06	Rot 5-4	c	
52	RIV 70	2-10-00 / 2-10-00	1:13 / 1:30	2.5	2.45	V		141.26	165.01	Rot 5-10	c	
53	ARB 8	2-10-00 / 2-11-00	9:13 / 10:15	2.5	2.51	V		234.81	258.91	Rot 5-8	c	
56	PLA 8	2-10-00 / 2-11-00	10:05 / 10:15	2.5	2.63	V		167.5	190.10	Rot 5-9	c	
57	SCH 8	2-10-00 / 2-11-00	10:50	2.5	2.70	V		240.69	264.44	Rot NB 5-5 water in sample	c	
59	How 8	2-11-00	11:45	2.5	2.49	V		234.98	263.40	Rot 5-3	c	
60	RIV 8	2-11-00	12:55	2.5	2.00	V		165.11	166.72	Rot 5-4	c	
61	Blank	2-10-00	1:20								c	
62	ARB 9	2-14-00 / 2-15-00	4:30 / 9:10	2.5	2.47	V		331.07	35?.85	Rot 5-8 Raining	o	
63	PLA 9	2-14-00	10:50 / 10:45	2.5	2.38	V		191.00	266.51	Rot 5-9 Raining	o	
64	Sc H 9	2-15-00	10:55	2.5	2.5	V		264.50	266.51	Rot 5-5 Dropped Sample	o	
65	How 9	2-14-00	12:00	2.5	2.47	V		263.432	297.55	Rot 5-3	o	
66	RIV 9	2-15-00	1:15	2.5	2.42	V		188.79	215.05	Rot 5-4	o	
67	ARB 10	2-16-00	9:10	2.5	2.23	V		354.10	378.87	Rot 5-9 Rained last night	k	

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SAMPLE FIELD LOG SHEET

Project: Benomyl Ambient Air Monitoring

Project # : C99-108

Log #	Sample ID	Date On/Off	Time On/Off	Start Flow (LPM)	End Flow (LPM)	Start Leak Check	End Leak Check	Start ETM Count	End ETM Count	Comments	Weather o=overcast pc=partly c=cloudy k=clear	Initials
68	PLA 10	2-15-00 / 2-16-00	10:20 / 10:25	2.5	1.63	✓		214.96	239.00 ~~239.00~~	Rot 5-9 Rained overnight	k/c	CC
69	SCH 10	2-15-00 / 2-16-00	11:06 / 11:05	2.5	2.52	✓		288.55	312.00	Rot 5-5	k/c	CC
70	How 10	2-15-00 / 2-16-00	12:00 / 12:00	2.5	2.68	✓		287.61	311.57	Rot 2B	k/c	CC
71	RIV 10	2-15-00 / 2-16-00	1:15 / 1:10	2.5	2.5	✓		213.10	236.96	Rot 5-4	k/c	CC
72	ARB 11	2-15-00 / 2-17-00	9:15 / 9:05	2.5	2.55	✓		378.93	402.76	Rot 5-8 Rainy	O	CC
73	ARB 4D	2-16-00 / 2-17-00	9:15 / 9:05	2.5	2.33	✓		378.94	402.76	Rot 5-1	O	CC
74	PLA 11	2-16-00 / 2-17-00	10:36 / 10:10	2.5	2.41	✓		239.07	262.77	Rot 5-9	O	CC
75	PLA 11D	2-16-00 / 2-17-00	10:33 / 10:10	2.5	2.43	✓		239.16	262.77	Rot 1B	O	CC
76	SCH 11	2-16-00 / 2-17-00	11:00 / 10:50	2.5	2.32	✓		312.56 ~~2B~~	336.36	Rot 11B	O	CC
77	SCH 11D	2-16-00 / 2-17-00	11:00 / 10:50	2.5	2.43	✓		312.58	335.39	Rot 5-5	O	CC
78	How 11	2-16-00 / 2-17-00	12:05 / 11:55	2.5	1.75	✓		311.63	335.46	Rot 5-3	O	CC
79	How 11D	2-16-00 / 2-17-00	12:05 / 11:55	2.5	2.48	✓		311.67	335.46	Rot 2B	O	CC
80	RIV 11	2-16-00 / 2-17-00	1:15 / 1:00	2.5	2.56	✓		236.96	260.88	Rot 5-4	O	CC
81	RIV 11D	2-16-00 / 2-17-00	1:15 / 1:00	2.5	2.5	✓		236.99	260.90	Rot 5-10	O	CC
82	ARB 12	2-17-00 / 2-18-00	9:10 / 9:05	2.5	2.49	✓		402.82	426.74	Rot 5-8	C	CC
83	PLA 12	2-17-00 / 2-18-00	10:15 / 10:10	2.5	2.52	✓		262.83	286.77	Rot 5-9	C	CC

SCH : Schelby School	ARB : ARB in Fresno
PLA : Plainsburg School	RIV : Riverview School
HOW : Howard School	

SAMPLE FIELD LOG SHEET

Project: Benomyl Ambient Air Monitoring

Project # : C99-108

Log #	Sample ID	Date On/Off	Time On/Off	Start Flow (LPM)	End Flow ( )	Start Leak Check	End Leak Check	Start ETM Count	End ETM Count	Comments	Weather o=overcast pc=partly c=cloudy k=clear	Initials
84	SCH 12	2.17-00 / 2.18-00	11:00 / 10:45	2.5	2.54	✓		336.43	360.26	Rot 5-5	C	cc
85	How 12	2.17-00 / 2.18-00	12:00 / 11:40	2.5	2.52	✓		335.52	359.24	Rot 5-3	C	cc
86	RIV 12	2.17-00 / 2.18-00	1:10 / 12:40	2.5	2.5	✓		260.93	284.45	Rot 5-4	C	cc
87	Blank	2.17-00 / 2.17-00	1:15 / 1:15								C	cc
88	ARB 13	2.21-00 / 2.22-00	9:15 / 9:15	2.5	2.31	✓		498.89	522.31	RoL 5-8	k	cc
89	PLA 13	2.21-00 / 2.22-00	10:15 / 10:15	2.5	2.5	✓		286.80	310.82	Rot 5-9	k	cc
90	SCH 13	2.21-00 / 2.22-00	10:45 / 10:45	2.5	2.61	✓		360.30	384.34	Rot 5-5	k	cc
91	How 13	2.21-00 / 2.22-00	11:45 / 11:45	2.5	2.54	✓		359.28	383.38	Rot 5-3	PC	cc
92	RIV 13	2.21-00 / 2.22-00	12:40 / 12:45	2.5	2.53	✓		356.49 ~~336.99~~	380.57	Rot 5-4	PC	cc
93	ARB 14	2.22-00 / 2.23-00	9:18 / 9:10	2.5	2.45	✓		522.39	546.78	Rot 5-8 Rained overnight	PC	cc
94	PLA 14	2.22-00 / 2.23-00	10:18 / 10:15	2.5	2.25	✓		310.85	334.83	Rot 5-9	C	cc
95	SCH 14	2.22-00 / 2.23-00	10:49 / 10:53	2.5	2.56	✓		384.39	408.42	Rot 5-5	O	cc
96	How 14	2.22-00 / 2.23-00	11:50 / 11:55	2.5	2.52	✓		383.49	407.52	Rof 5-3	O	cc
97	RIV 14	2.22-00 / 2.23-00	12:50 / 1:00	2.5	2.35	✓		380.60	404.79	Rot 5-4	O	cc
98	ARB 15	2.23-00 / 2.23-00	9:10 / 9:05	2.5	2.56	✓		546.81	570.79	Rof 5-8 Raining	O	cc
99	ARB (5D)	2.23-00 / 2.24-00	9:10 / 9:05	2.5	2.58	✓		546.83	570.77	Rof 5-1 Raining	O	cc

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SAMPLE FIELD LOG SHEET

Project: Benomyl Ambient Air Monitoring
Project #: C99-108

SCH : Schelby School   ARB : ARB in Fresno
PLA : Plainsburg School   RIV : Riverview School
HOW : Howard School

Log #	Sample ID	Date On/Off	Time On/Off	Start Flow (LPM)	End Flow (LPM)	Start Leak Check	End Leak Check	Start ETM Count	End ETM Count	Comments	Weather (o=overcast pc=partly cloudy c=cloudy k=clear)	Initials
100	PLA 15	2-23-00 / 2-24-00	10:18 / 10:10	2.5	2.65	✓		334.90	358.06	Rot 5-9	pc	CC
101	PLA 15 D	2-23-00 / 2-24-00	10:20 / 10:10	2.5	2.62	✓		334.95	358.03	Rot 5-5	pc	CC
102	SCH 15	2-23-00 / 2-24-00	10:55 / 10:45	2.5	2.35	✓		406.95	432.25	Rot 5-5	pc	CC
103	SCH 15D	2-23-00 / 2-24-00	10:45 / 12:00	2.5	2.45	✓		406.45	432.25	Rot 11P	pc	CC
104	HOW 15	2-23-00 / 2-24-00	11:45 / 12:00	2.5	2.43	✓		407.55	431.32	Rot 5-3	pc	CC
105	HOW 15D	2-23-00 / 2-24-00	12:00 / 11:45	2.5	2.29	✓		407.55	431.34	Rot 2B	pc	CC
106	RIV 15	2-23-00 / 2-24-00	1:05 / 12:46	2.5	2.62	✓		404.83	428.80	Rot 5-4	pc	CC
107	RIV 15D	2-23-00 / 2-24-00	9:10 / 12:05	2.5	2.4	✓		404.83	428.80	Rot 5-0	K	CC
108	ARB 16	2-24-00 / 2-25-00	9:05 / 10:15	2.5	2.44	✓		570.86	594.74	Rot 6-8	O	CC
109	PLA 16	2-24-00 / 2-25-00	10:15 / 10:00	2.5	2.44	✓		358.08	382.62	Rot 5-9	O	CC
110	SCH 16	2-24-00 / 2-25-00	10:35 / 10:49	2.5	2.54	✓		432.30	456.16	Rot 5-5	O	CC
111	HOW 16	2-24-00 / 2-25-00	11:50 / 11:30	2.5	2.62	✓		431.38	455.11	Rot 5-3	O	CC
112	RIV 16	2-24-00 / 2-25-00	12:30 / 12:49	2.5	2.63	✓		428.55	452.31	Rot 5-4	O	CC
113	Blank		12:45 / 12:05							Rot 5-8	O	CC
114	ARB 17	2-28-00 / 2-28-00	9:05 / 9:10	2.5	2.31	✓		596.60	620.70	Rot 5-8 Rained overnight	O	CC
115	PLA 17	2-28-00 / 2-29-00	10:20 / 10:20	2.5	2.38	✓		382.06	406.94	Rot 5-9 Rained	pc	CC

AIR RESOURCES BOARD

01/00

SAMPLE FIELD LOG SHEET
Project: Benomyl Ambient Air Monitoring
Project # : C99-108

Log #	Sample ID	Date On/Off	Time On/Off	Start Flow (LPm)	End Flow ( )	Start Leak Check	End Leak Check	Start ETM Count	End ETM Count	Comments	Weather o=overcast pc=partly c=cloudy k=clear	Initials
116	SCH 17	2-28-00 2-29-00	10:30 10:55	2.5	2.43	✓		528.11	552.44	Rot 5-5 Rained	C	SS
117	How 17	2-28-00 2-29-00	11:35 11:35	2.5	2.46	√		527.12	551.50	Rot ~~~~ 28 Rained	C	SS
118	Riv 17	2-28-00 2-29-00	12:30 1:00	2.5	2.41	✓		524.27	548.76	Rot 5-4 Rained	PC	CC
119	ARB 18	2-29-00 3-1-00	9:15 9:10	2.5	2.48	√		620.75	644.68	Rot 5-8	O	CC
120	PLA 18	2-29-00 3-1-00	10:23 10:10	2.5	2.52	√		406.99	430.72	Rot 5-9	O	CC
121	SCH 18	2-29-00 3-1-00	10:55 10:42	2.5	2.51	√		552.49	576.24	Rot 11B	O	CC
122	How 18	2-29-00 3-1-00	12:00 11:42	2.5	2.65	√		551.58	575.25	Rot 2 B	O	CC
123	RIV 18	2-29-00 3-1-00	1:03 12:40	2.5	2.59	√		548.80	572.46	Rot 5-4	O	BC
124	ARB 19	3-1-00 3-2-00	9:15 9:05	2.5	2.41	√		644.73	668.60	Rot 5-8	O	CC
125	ARB 19D	3-1-00 3-2-00	9:15 9:05	2.5	2.43	√		644.73	668.60	Rot 5-1	O	CC
126	PLA 19	3-1-00 3-2-00	10:15 10:20	2.5	2.45	√		430.87	454.93	Rot 5-9	K	CC
127	PLA 19D	3-1-00 3-2-00	10:15 10:20	2.5	2.43	√		430.87	454.93	Rot ~~~~	K	CC
128	SCH 19	3-1-00 3-2-00	10:45 10:55	2.5	2.57	√		576.30	600.44	Rot 11B	K	CC
129	SCH 19D	3-1-00 3-2-00	10:45 10:55	2.5	2.5	√		576.30	600.44	Rot 5-5	K	CC
*130	How 19	3-1-00 3-2-00	11:45 12:00	2.5	3.55	√		575.30	599.53	Rot 5-3	15	CC
131	How 19D	3-1-00 3-2-00	11:45 12:00	2.5	2.58	√		755.70	599.53	Rot 2 3	K	CC

* Verified and flow of 3.55 by Chris (student) at ARB Fresno.

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SAMPLE FIELD LOG SHEET
Project: Benomyl Ambient Air Monitoring
Project # : C99-108

Log #	Sample ID	Date On/Off	Time On/Off	Start Flow (LPM)	End Flow (LPM)	Start Leak Check	End Leak Check	Start ETM Count	End ETM Count	Comments	Weather o=overcast pc=partly c=cloudy k=clear	Initials
132	RIV 19	3-1-00 / 3-2-00	12:43 / 1:00	2.5	2.38	✓		572.51	596.79	Rot 5-4	pc	
133	RIV 19D	3-1-00 / 3-2-00	12:43 / 1:00	2.5	2.51	✓		572.51	596.80	Rot 5-10	pc	
134	ARB 20	3-2-00 / 3-3-00	9:10 / 9:10	2.5	2.51	✓		668.67	692.68	Pot 5-8	c	
135	PLA 20	3-2-00 / 3-3-00	10:23 / 10:05	2.5	2.48	✓		454.97	478.69	Rot 5-9	o	
136	SCH 20	3-2-00 / 3-3-00	11:00 / 10:35	2.5	2.47	✓		600.57	624.11	Rot 5-5	d	
137	How 20	3-2-00 / 3-3-00	12:00 / 11:30	2.5	2.38	✓		600.00	623.11	Rot ≥ 8	o	
138	Blank	3-2-00 / 3-2-00	1:03 / 1:03								o	
139	RIV 20	3-2-00 / 3-3-00	1:03 / 12:45	2.5	2.46	✓		596.83	620.54	Rot 5-4	o	
140	ARB 21	3-6-00 / 3-7-00	9:10 / 9:05	2.5	2.61	✓		764.77	788.60	Rot 5-8	k	
141	PLA 21	3-6-00 / 3-7-00	10:05 / 10:00	2.5	2.31	✓		478.73	502.46	Rot 5-9	pc	
142	SCH 21	3-6-00 / 3-7-00	10:45 / 10:30	2.5	2.44	✓		696.32	720.09	Rot 5-5	pc	
143	How 21	3-6-00 / 3-7-00	11:45 / 11:30	2.5	2.31	✓		695.35	719.09	Rot ~~~~~ 5-3	pc	
144	RIV 21	3-6-00 / 3-7-00	12:50 / 12:50	2.5	2.61	✓		620.58	644.54	Rot 5-4	pc	
145	ARB 22	3-7-00 / 3-8-00	9:10 / 9:10	2.5	2.40	✓		788.57	812.58	Rot 5-8	pc	
146	PLA 22	3-7-00 / 3-8-00	10:05 / 10:05	2.5	2.5	✓		502.50	526.57	Rot 5-9	o	
147	SCH 22	3-7-00 / 3-8-00	10:35 / 10:45	2.5	2.73	✓		720.13	744.27	Rot 5-5	G	

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AIR RESOURCES BOARD

01/00

SAMPLE FIELD LOG SHEET
Project: Benomyl Ambient Air Monitoring
Project # : C99-108

SCH : Schelby School   ARB : ARB in Fresno
PLA : Plainsburg School   RIV : Riverview School
HOW : Howard School

Log #	Sample ID	Date On/Off	Time On/Off	Start Flow (LPM)	End Flow (LPM)	Start Leak Check	End Leak Check	Start ETM Count	End ETM Count	Comments	Weather o=overcast pc=partly c=cloudy k=clear	Initials
148	HOW 22	3-7-00 / 3-8-00	11:35 / 11:50	2.5	2.61	✓		719.24	743.41	Rot 5-3	O	GP
149	RIV 22	3-7-00 / 3-8-00	12:55 / 12:55	2.5	2.69	✓		684.59	669.59	Rot 5-4	O	
150	ARB 23	3-8-00 / 3-9-00	9:13 / 9:10	2.5	2.51	✓		812.60	836.70	Rot 5-8	O	GP
151	ARB 23D	3-8-00 / 3-9-00	9:13 / 9:10	2.5	2.51	✓		812.60	836.70	Rot 5-1	O	
152	PLA 23	3-8-00 / 3-9-00	10:10 / 10:10	2.5	2.53	✓		526.61	550.60	Rot 5-9	O	CC
153	PLA 23D	3-8-00 / 3-9-00	10:10 / 10:10	2.5	2.52	✓		526.61	550.63	Rot 1 B	O	
154	SCH 23	3-8-00 / 3-9-00	10:48 / 10:46	2.5	2.4	✓		744.30	768.23	Rot 5-5	PC	
155	SCH 23D	3-8-00 / 3-9-00	10:48 / 10:40	2.5	2.1	✓		744.30	768.23	Rot 11B	PC	
156	HOW 23	3-8-00 / 8-9-00	11:55 / 11:55	2.5	2.48	✓		743.49	767.49	Rot 5-3	C	
157	HOW 23D	3-8-00 / 3-9-00	11:55 / 12:00	2.5	2.16	✓		743.49	767.49	Rot 2 B	C	CC
158	RIV 23	3-8-00 / 3-9-00	1:00 / 1:10	2.5	2.5	✓		668.64	692.91	Rot 5-4	O	
159	RIV 23D	3-8-00 / 3-9-00	1:00 / 1:10	2.5	2.53	✓		668.64	692.93	Rot 5-10	O	
160	ARB 24	3-9-00 / 3-10-00	9:15 / 9:05	2.5	2.45	✓		836.77	860.61	Rot 5-8	K	
161	PLA 24	3-9-00 / 3-10-00	10:15 / 10:05	2.5	2.35	✓		550.64	574.57	Rot 5-9	O	CC
162	SCH 24	3-9-00 / 3-10-00	10:43 / 10:40	2.5	2.54	✓		768.28	792.19	Rot 5-5	O	CC
163	HOW 24	3-9-00 / 3-10-00	12:00 / 11:40	2.5	2.45	✓		767.53	791.23	Rot 5-3		

AIR RESOURCES BOARD

01/00

SCH : Schelby School ARB : ARB in Fresno
PLA : Plainsburg School RIV : Riverview School
HOW : Howard School

SAMPLE FIELD LOG SHEET

Project: Benomyl Ambient Air Monitoring

Project # : C99-108

Log #	Sample ID	Date On/Off	Time On/Off	Start Flow (LPM)	End Flow (LPM)	Start Leak Check	End Leak Check	Start ETM Count	End ETM Count	Comments	Weather o=overcast pc=partly c=cloudy k=clear	Initials
164	RIV 24	3-9-00 3-10-00	1:15 12:35	2.5	2.32	✓		692.93	716.32	Ro ≤ 5-4	PC	CC
165	Blank	3-9-00 3-9.00	1:15 1:15								PC	CC

SCH : Schelby School   ARB : ARB in Fresno
PLA : Plainsburg School   RIV : Riverview School
HOW : Howard School

SAMPLE FIELD LOG SHEET

Project: BIC Ambient Air Monitoring
Project # : C99-108

Log #	Sample ID	Date On/Off	Time On/Off	Start Flow (cc/min)	End Flow	Start Leak Check	End Leak Check	Start ETM Count	End ETM Count	Comments	Weather (o=overcast, pc=partly cloudy, c=cloudy, k=clear)	Initials
1	SCH 1	1-31-00 / 2-1-00	11:00 / 10:55	.30	35.1	✓		0.73	24.51	Rotormeter 30cc 5	C	
2	PLA 1	1-31-00 / 2-1-00	10:00 / 12:00	.30	30.5	✓			22.62	Rotormeter 30cc 2	C	
3	How 1	1-31-00 / 2-1-00	1:00 / 12:00	.30	31.0	✓		0.55	23.65	Rotormeter 30cc 1	P.C	P.G.
4	Riv 1	1-31-00 / 2-1-00	2:10 / 1:15	.30	33.4	✓		0.63	23.73	Rotormeter 30cc 1	C	P.G.
5	ARB 1	1-31-00 / 2-1-00	3:00 / 2:00	.30	24.7	✓		0.62	23.67	Rotormeter 30cc 7	C	P.G.
6	FS-1	1-31-00 / 2-1-00	3:00 / 2:00	.30	28.4	✓		.63	23.67	Rot 30cc 8	C	P.G.
7	FS-2	1-31-00 / 2-1-00	3:00 / 2:00	.30	24.8	✓		.63	23.67	Rot 30cc 9	C	
8	PLA 2	2-1-00	10:00	.30	31.1	✓		22.86	46.63	Rotormeter 30cc 2	K	P.G.
9	Sch 2	2-1-00	10:55	.30	32.8	✓		24.65	48.36	Rotormeter 30cc 5	K	P.G.
10	How 2	2-1-00	12:05	30	30.5	✓		23.76	47.45	Rotormeter 30cc 1	K	P.G.
11	Riv 2	2-1-00	12:05 / 1:05	30	30.7	✓		23.84	47.45	Rotormeter 30cc 11	K	P.G.
12	ARB 2	2-1-00	2:00 / 1:50	30	31.4	✓		23.75	47.11	Rotormeter 30cc 7	K	
13	FS-3	2-1-00 / 2-2-00	1:55	30	29	✓		2401	47.53	30cc 8	K	KTA
14	FS-4	2-1-00	1:55 / 1430	30	28.1	✓		2400	47.53	30cc 9	K	KTA
15	PLA 3	2-3-00	10:00	50	30.0	✓		46.16	70.60	Rot 30 cc		P.G.
16	PLA 3 D	2-3-00	10:00	50	28.5	✓		46.16	70.60	Rot 30 cc	K	P.G.

AIR RESOURCES BOARD

01/00

SCH : Schelby School   ARB : ARB in Fresno
PLA : Plainsburg School   RIV : Riverview School
HOW : Howard School

SAMPLE FIELD LOG SHEET
Project: BIC Ambient Air Monitoring
Project # : C99-108

Log #	Sample ID	Date On/Off	Time On/Off	Start Flow ( )	End Flow ( )	Start Leak Check	End Leak Check	Start ETM Count	End ETM Count	Comments	Weather o=overcast pc=partly c=cloudy k=clear	Initials
17	Sch 3	2.3.00 10:50		30	30	V		48.80	72.27	Rot 30cc5	k	P.G
18	Sch 3b	2.3.00 10:50		30	29.9	/		48.57	72.27	Rot 30cc4	k	P.G
19	How 3	2.3.00 12:05		30	30.4	V		47.74	71.42	Rot 30cc1	k	P.G
20	How 3b	2.3.00 12:00		30	29.7	v		47.54	71.42	Rot 30cc16	k	P.G
21	Riv 3	2.3.00 1:05		30	31.4	V		47.??	71.55	Rot 30cc11	k	P.G
22	Riv 3b	2.3.00 1:05		30	29.1	/		47.??	71.55	Rot 30cc10	k	P.G
23	Blank	2.3.00 1:05	→			☑		~~~~~~~~~		————	——	P.G
24	ARB 3	2.3.00 1:55		30	30.0	v		47.??	71.56	Rot 30cc7	k	P.G
25	ARB 3b	2.3.00 1:55		30	27.6	v		47.??	71.56	Rot 30cc8	k	BG
26	PLA 4	2.3.00 10:05 / 10:05		30	35.6	V		70.76	94.68	Rot 30CC 2	PC	P.G.
27	SCH 4	2.3.00 10:50 / 10:45		30	37.8	/		72.43	96.28	Rot 30 CC 5	P.C	P.G.
28	How 4	2.3.00 11:50 / 11:45		30	35.1	V		71.48	95.24	Rot 30CC1	PC	P.G.
29	Riv 4	2.3.00 1:10 / 1:00		30	30.6	V		71.74	42.54	Rot 30cc11	K	P.G.
30	Aeb 4	2.3.00 2:05 / 12:??		30	34.8	V		71.71	94.07	Rot 30cc7	PC	P.G.
31	Aeb 5	2.7.00 9:00 / 2.8.00 9:10		50	73.7	V		162.64	186.15	Rot 30cc7	K	P.G.
32	PLA 5	2.7.00 10:05 / 2.8.00 10:10		30	30	V		94.71	118.87	Rot 30cc2	K	P.G

AIR RESOURCES BOARD

01/00

SCH : Shelbly School   ARB : ARB in Fresno
PLA : Plainsburg School   RIV : Riverview School
HOW : Howard School

SAMPLE FIELD LOG SHEET

Project: BIC Ambient Air Monitoring
Project # : C99-108

Log #	Sample ID	Date On/Off	Time On/Off	Start Flow	End Flow	Start Leak Check	End Leak Check	Start ETM Count	End ETM Count	Comments	Weather o=overcast pc=partly cloudy c=cloudy k=clear	Initials
33	Sch 5	2-7-00 / 2-9-00	10:46 / 10:50	30	30	✓		168.22	192.38	Rot 30cc 5	k	P.G.
34	How 5	2-7-00 / 2-8-00	11:35 / 11:45	30	31.1	✓		167.18	191.36	Rot 30cc 12	k	P.G.
35	Riv 5	2-7-00 / 2-8-00	12:50 / 12:45	30	30	✓		92.94	116.55	Rot 30cc 11	k	P.G.
36	ARb 6	2-8-00 / 2-9-00	9:00 / 9:15	30	29.6	✓		186.75	210.45	Rot 30cc 7	k	P.G.
37	PLA 6	2-8-00 / 2-9-00	10:15 / 10:40	30	29.5	✓		118.87	143.19	Rot 30cc 2	k	P.G.
38	Sch 6	2-8-00 / 2-9-00	10:50 / 11:10	30	27.4	✓		192.38	216.80	Rot 30cc 5	k	P.G.
39	How 6	2-8-00 / 2-9-00	11:50 / 12:15	30	26.0	✓		191.36	215.35	Rot 30cc 12	k	P.G.
40	Riv 6	2-8-00 / 2-9-00	12:45 / 1:30	30	29.0	✓		116.53	141.18	Rot 30cc 11	k	P.G.
41	Arb 7	2-9-00 / 2-10-00	9:05 / 9:20	30	31.6	✓		210.15	234.70	Rot 30cc 7	o	P.G.
42	Areb 7D	2-9-00 / 2-10-00	9:10 / 9:20	30	29.1	✓		210.15	234.70	Rot 30cc 8	o	P.G.
43	PLA 7	2-9-00 / 2-10-00	10:25 / 10:40	30	30.5	✓		143.19	167.02	Rot 30cc 3	o	P.G.
44	PLA 7D	2-9-00 / 2-10-00	10:25 / 10:40	30	30.4	✓		143.19	167.02	Rot 30cc 3	o	P.G.
45	Sch 7	2-9-00 / 2-10-00	11:05 / 11:15	30	38.0	✓		216.80	240.61	Rot 30cc 5	o	P.G.
46	Sch 7D	2-9-00 / 2-10-00	11:05 / 11:15	40	30.8	✓		216.80	240.61	Rot 30cc 4	o	P.G.
47	How 7	2-9-00 / 2-10-00	12:00 / 12:15	30	30.4	✓		215.85	239.65	Rot 30cc 12	o	P.G.
48	How 7D	2-9-00 / 2-10-00	12:00 / 12:15	30	32.6	✓		215.85	239.65	Rot 30cc 12	o	P.G.

SAMPLE FIELD LOG SHEET

Project: BIC Ambient Air Monitoring
Project # : C99-108

Log #	Sample ID	Date On/Off	Time On/Off	Start Flow ( )	End Flow ( )	Start Leak Check	End Leak Check	Start ETM Count	End ETM Count	Comments	Weather o=overcast pc=partly c=cloudy k=clear	Initials
49	Riv 7	2-9-00 2-10-00	1:25 1:15	30	32.8	✓		141.18	16497	Rot 30 CC 11	PC	P.G.
50	Riv 7D	2-9-00 2-10-00	1:25 1:25	30	31.0	✓		141.18	16497	Rot 30 CC 10	PC	P.G.
51	Arb 8	2-10-00 2-11-00	9:15 9:15	30	30	✓		234.83	258.87	Rot 30 CC 8	PC	P.G.
52	PLA 8	2-10-00 2-11-00	10:25 10:15	30	33.6	✓		167.02	190.90	Rot 30 CC 2	PC	P.G.
53	Sch 8	2-10-00 2-11-00	11:10 10:50	30	39.5	✓		240.61	264.44	Rot 30 CC 5	PC.	P.G.
54	How 8	2-10-00 2-11-00	12:00 11:45	30	34.7	✓		239.65	263.40	Rot 30 CC 12	PC	P.G.
55	Riv 8	2-10-00 2-11-00	1:15 1:00	30	00.6	✓		16497	188.72	Rot 30 CC 11 (SAMPLE WAS VERY WET)	PC	P.G.
56	BLANK	2-10-00	1:15	—	—	—		—		BLANK	—	P.G.
57	Arb 9	2-14-00 2-15-00	9:30 9:10	30	30	✓		331.07	354.77	Rot 30 CC 8	C	P.G.
58	PLA 9	2-14-00 2-15-00	10:20 10:20	30	28.3	✓		191.00	214.91	Rot 30 CC 2	O	CC
59	Sch 9	2-14-00 2-15-00	11:00 11:00	30	32.4	✓		264.50	288.48	Rot 30 CC 5	PC	P.G
60	How 9	2-14-00 2-15-00	11:55 12:00	30	30	✓		263.93	287.57	Rot 30 CC 10	O	A.G.
61	Riv 9	2-14-00 2-15-00	1:00 1:20	30	29.5	✓		28.76	213.05	Rot 30 CC 11	O	P.G.
62	Arb 10	2-15-00 2-16-00	9:10 9:10	30	34.1	✓		354.77	378.88	Rot 30 CC 8	K	P.G
63	PLA 10	2-15-00 2-16-00	10:20 10:25	30	31.9	✓		214.91	239.97	Rot 30 CC 2	K	P.G.
64	Sch 10	2-15-00 2-16-00	11:00 11:00	30	34.5	✓		288.48	312.56	Rot 30 CC 5	K	P.G.

* Verified and flow of 0.6 by Chris (student) at ARB fresno, says to much water in tube.

AIR RESOURCES BOARD

01/00

SAMPLE FIELD LOG SHEET

Project: BIC Ambient Air Monitoring
Project # : C99-108

Log #	Sample ID	Date On/Off	Time On/Off	Start Flow ( )	End Flow ( )	Start Leak Check	End Leak Check	Start ETM Count	End ETM Count	Comments	Weather o=overcast pc=partly c=cloudy k=clear	Initials
65	How 10	2-15-00 2-15-00	12:00 12:05	30	53.9	✓		287.67	311.57	Rot 30 cc 1	K	P.G.
66	Riv 10	2-15-00 2-16-00	1:20 1:25	30	.5	✓		253.05	236.96	Rot 30 cc 11 Sample is WET	O	P.G.
67	Arb 10	2-16-00 2-17-00	9:10 9:00	30	35.1	✓		378.88	402.80	Rot 30 cc 8	C	P.G.
68	Arb 11 D	2-16-00 2-17-00	9:10 9:00	30	26	✓		378.88	402.80	Rot 30 cc 7	C	P.G.
69	PLA 11	2-16-00 2-17-00	10:25 10:10	30	31.8	✓		239.97	262.73	Rot 30 cc 2	C	P.G.
70	PLA 11 D	2-16-00 2-17-00	10:25 10:10	30	32.8	✓		239.97	262.73	Rot 30 cc 3	C	P.G.
71	Sch 11	2-16-00 2-17-00	11:00 10:50	30	31.0	✓		317.56	336.36	Rot 30 cc 5	C	P.G.
72	Sch 11 D	2-16-00 2-17-00	11:00 10:50	30	29.6	✓		317.56	336.36	Rot 30 cc 4	C	P.G.
73	How 11	2-16-00 2-17-00	12:05 11:55	30	30.8	✓		311.57	335.46	Rot 30 cc 1	C	P.G.
74	How 11 D	2-16-00 2-17-00	12:05 11:55	30	30.3	✓		311.57	335.46	Rot 30 cc 12	C	P.G.
75	Riv 11	2-16-00 2-17-00	1:15 1:00	30	27.0	✓		236.96	360.89	Rot 30 cc 11	C	P.G.
76	Riv 11 D	2-16-00 2-17-00	1:15 1:00	30	28.1	✓		236.96	360.89	Rot 30 cc 10	C	P.G.
77	Arb 12	2-17-00 2-18-00	9:05 9:05	30	30	✓		402.80	476.15	Rot 30 cc 8	P.C.	P.G.
78	PLA 12	2-17-00 2-18-00	10:10 10:10	30	29.7	✓		262.73	286.77	Rot 30 cc 2	P.C.	P.G.
79	Sch 12	2-17-00 2-18-00	10:50 10:45	30	31.0	✓		336.36	360.26	Rot 30 cc 5	P.C.	P.G.
80	How 12	2-17-00 2-19-00	11:55 11:40	30	36.2	✓		335.46	359.24	Rot 30 cc 1	P.C.	P.G.

* Verified and flow of 0.5 by Chris at ARB Fresno. Says to much water in test tube.

SAMPLE FIELD LOG SHEET

Project: BIC Ambient Air Monitoring
Project # : C99-108

Log #	Sample ID	Date On/Off	Time On/Off	Start Flow ( )	End Flow ( )	Start Leak Check	End Leak Check	Start ETM Count	End ETM Count	Comments	Weather o=overcast pc=partly c=cloudy k=clear	Initials
81	Riv 12	2-17-00 2-18-00	1:00 12:40	30	36.2	✓		260.89	284.45	Rot 30 CC 11	P.C.	P.G
82	Blank	2-17-00	1:00							BLANK	PC	P.G
83	Aeb 13	2-21-00 2-22-00	9:10 9:15	30	27.1	✓		498.89	522.91	Rot 30 CC 8	⚡ K	P.G
84	PLA 13	2-21-00 2-22-00	10:15 10:15	30	34.3	✓		286.80	310.85	Rot 30 CC 2	K	P.G
85	Sch 13	2-21-00 2-22-00	10:45 10:50	30	33.4	✓		360.30	384.34	Rot 30 CC 5	K	P.G
86	How 13	2-21-00 2-22-00	11:45 11:50	30	30.5	✓		359.28	383.36	Rot 30 CC 1	K	P.G.
87	Riv 13	2-21-00 2-22-00	12:40 12:50	30	39.4	✓		356.50	380.57	Rot 30 CC 11	PC	P.G
88	Aeb 14	2-22-00 2-23-00	9:15 9:15	30	32.1	✓		522.91	546.82	Rot 30 CC 8 Rain over Night	K	P.G
89	PLA 14	2-22-00 2-23-00	10:15 10:15	30	39.4	✓		310.85	334.84	Rot 30 CC 2	C	P.G
90	Sch 14	2-22-00 2-23-00	10:50 10:55	30	32.4	✓		384.34	408.41	Rot 30 CC 5	C	P.G.
91	How 14	2-22-00 2-23-00	10:50 11:55	30	36.9	✓		383.36	402.46	Rot 30 CC 1	C	P.G
92	Riv 14	2-22-00 2-23-00	12:50 1:00	30	27.4	✓		380.57	404.79	Rot 30 CC 11	C	P.G.
93	Aeb 15	2-23-00 2-24-00	9:15 9:10	30	33.3	✓		546.82	570.79	Rot 30 CC 8 RAINING	O	P.G
94	Aeb 15D	2-23-00 2-24-00	9:15 9:10	30	30.0	✓		546.82	570.79	Rot 30 CC 7 RAINING	O	P.G
95	PLA 15	2-23-00 2-24-00	10:15 10:10	30	31.9	✓		334.84	358.74	Rot 30 CC 2	PC	P.G.
96	PLA 15 D	2-23-00 2-24-00	10:15 10:10	30	33.0	✓		334.84	358.74	Rot 30 CC 3	PC	P.G.

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SCH : Schelby School ARB : ARB in Fresno
PLA : Plainsburg School RIV : Riverview School
HOW : Howard School

SAMPLE FIELD LOG SHEET
Project: BIC Ambient Air Monitoring
Project # : C99-108

Log #	Sample ID	Date On/Off	Time On/Off	Start Flow ( )	End Flow ( )	Start Leak Check	End Leak Check	Start ETM Count	End ETM Count	Comments	Weather o=overcast pc=partly c=cloudy k=clear	Initials
97	Sch 15	2-23-00 2-24-00	10:55 10:45	30	30.6	✓		408.39	432.24	Ret 30 cc5	o C	P.G.
98	Sch 15 D	2-23-00 2-24-00	10:45 10:45	30	31.0	✓		408.41	472.24	Ret 30 cc4	p c	P.G.
99	How 15	2-23-00 2-24-00	11:55 11:50	30	28.3	✓		407.46	431.31	Ret 30 cc1	pc	P.G.
100	How 15 D	2-23-00 2-24-00	11:55 11:50	30	32.4	✓		407.46	431.3	Ret 30 cc12	pc	P.G.
101	Riv 15	2-23-00 2-24-00	1:00 12:40	30	32.1	✓		444.79	428.50	Ret 30 cc11	K	P.G.
102	Riv 15 D	2-23-00 2-24-00	1:00 12:40	30	28.0	✓		404.79	428.50	Ret 30 cc10	K	P.G.
103	Arb 16	2-24-00 2-25-00	9:15 9:10	30	32.6	✓		570.79	594.15	Ret 30 cc8	K	P.G.
104	PLA 16	2-24-00 2-25-00	10:10 10:45	30	31.6	✓		358.74	382.62	Ret 30 cc2	pc	P.G.
105	Sch 16	2-24-00 2-25-00	10:45 10:35	30	31.1	✓		472.24	45b.67	Ret 30 cc5	o	P.G.
106	How 16	2-24-00 2-25-00	11:50 11:35	30	30.9	✓		431.31	455.15	Ret 30 cc1	o	P.G.
107	Riv 16	2-24-00 2-25-00	12:40 12:30	30	30.9	✓		428.50	452.31	Ret 30 cc11	o	P.G.
108	BLANK									Blank	o	P.G.
109	Arb 17	2-28-00 2-29-00	9:10 9:10	30	31.0	✓		596.67	620.66	Ret 30 cc8	pc	P.G.
110	PLA 17	2-28-00 2-29-00	10:05 10:20	30	34.4	✓		382.66	406.94	Ret 30 cc2	pc	P.G.
111	Sch 17	2-28-00 2-29-00	10:35 10:55	30	31.0	✓		520.11	552.44	Ret 30 cc4	pc	P.G.
112	How 17	2-28-00 2-29-00	11:35 12:00	30	32.5	✓		527.12	551.50	Ret 30 cc12	pc	P.G.

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SAMPLE FIELD LOG SHEET

Project: BIC Ambient Air Monitoring

Project #: C99-108

SCH : Shelby School   ARB : ARB in Fresno
PLA : Plainsburg School   RIV : Riverview School
HOW : Howard School

Log #	Sample ID	Date On/Off	Time On/Off	Start Flow ( )	End Flow ( )	Start Leak Check	End Leak Check	Start ETM Count	End ETM Count	Comments	Weather (o=overcast pc=partly cloudy c=cloudy k=clear)	Initials
113	Riv17	2-28-00 / 2-28-00	12:30 / 1:00	30	30.0	✓		524.24 / 5-18-26		Ret 30 cc 11	P.C	ARB
114	Arb18	2-24-00 / 3-1-00	9:15 / 9:15	30	29.9	✓		62266	644.68	Ret 30 cc 9	O	P.G.
115	PLA18	2-29-00 / 3-1-00	10:20 / 10:10	30	29.4	✓		62266		Ret 30 cc 8	O	P.G.
116	PLA18	2-29-00 / 3-1-00	10:45 / 10:45	30	29.5	✓		406.74	430.77	Ret 30 cc 2	O	P.G.
117	How18	2-29-00 / 3-1-00	12:00 / 12:00	30	31.8	✓		552.44	576.24	Ret 30 cc 4	O	P.G.
118	Riv18	2-29-00 / 3-1-00	1:00 / 12:45	30	30.5	✓		551.50	572.24	Ret 30 cc 13	O	P.G.
119	Arb19	3-1-00 / 3-2-00	9:15 / 9:10	30	28.9	✓		548.76	572.46	Ret 30 cc 11	O	P.G.
120	Arb19	3-1-00 / 3-2-00	10:10 / 10:10	30	31.4	✓		644.68	668.65	Ret 30 cc 8	pc	P.G.
121	PLA19	3-1-00 / 3-2-00	10:20 / 10:20	30	29.4	✓		430.77	454.42	Ret 30 cc 7	pc	P.G.
122	PLA19	3-1-00 / 3-2-00	10:55 / 10:55	30	32.3	✓		430.77	454.42	Ret 30 cc 2	K	P.G.
123	Sch19	3-1-00 / 3-2-00	10:45 / 10:45	30	31.1	✓		576.24	600.46	Ret 30 cc 3	K	P.G.
124	Sch19	3-1-00 / 3-2-00	11:40 / 12:00	30	34.8	✓		576.24	600.44	Ret 30 cc 4	K	P.G.
125	How19	3-1-00 / 3-2-00	12:00 / 12:00	30	31.5	✓		575.24	54953	Ret 30 cc 12	K	P.G.
124	How19	3-1-00 / 3-2-00	12:00 / 12:00	30	34.3	✓		57524	54953	Ret 30 cc 1	K	P.G.
124	How19	3-1-00 / 3-2-00	12:00 / 12:40	30	40.6	✓		57524	54673	Ret 30 cc 11	K	P.G.
147	Riv19	3-2-00 / 3-1-00	1:00 / 12:40	30	40.6	✓		57248	54673	Ret 30 cc 11	pc	P.G.
128	Riv19	3-2-00 / 3-2-00	1:00 / 1:00	30	300	✓		57248	54677	Ret 30 cc 10	pc	P.G.

SCH : Schelby School	ARB : ARB in Fresno
PLA : Plainsburg School	RIV : Riverview School
HOW : Howard School	

SAMPLE FIELD LOG SHEET

Project: BIC Ambient Air Monitoring

Project # : C99-108

Log #	Sample ID	Date On/Off	Time On/Off	Start Flow ( )	End Flow ( )	Start Leak Check	End Leak Check	Start ETM Count	End ETM Count	Comments	Weather o=overcast pc=partly c=cloudy k=clear	Initials
129	Arb 20	3.2.00 / 3.3.00	9:10 / 9:10	30	31.2	✓		668.65	692.67	Rot 30 CC 8	pc	P.G.
130	PLA 20	3.2.00 / 3.3.00	10:20 / 10:05	30	30.4	✓		454.92	478.69	Rot 30 CC 2	O	P.G.
131	Sch 20	3.2.00 / 3.3.00	10:55 / 10:35	30	320	✓		600.44	624.11	Rot 30 CC 5	O	P.G.
132	How 20	3.2.00 / 3.3.00	12:00 / 11:30	30	30.5	✓		599.53	623.08	Rot 30 CC 12	O	P.G.
133	Riv 20	3.2.00 / 3.3.00	1:00 / 12:45	30	28.0	✓		596.79	620.54	Rot 7 CC 11	O	P.G.
134	BLANK	3.2.00	1:00							BLANK	—	P.G.
135	Arb 21	3.6.00 / 3.7.00	9:10 / 9:10	30	31.0	✓		764.67	798.60	Rot 30 CC 8	k	P.G.
136	PLA 21	3.6.00 / 3.7.00	10:15 / 10:00	30	35.5	✓		478.73	502.46	Rot 30 CC 2	k	P.G.
137	Sch 21	3.6.00 / 3.7.00	10:45 / 10:30	30	33.1	✓		696.32	720.09	Rot 30 CC 5	k	P.G.
138	How 21	3.6.00 / 3.7.00	11:45 / 11:30	30	33.2	✓		695.35	719.09	Rot 30 CC 12	k	P.G.
139	Riv 21	3.6.00 / 3.7.00	12:50 / 12:50	30	34.2	✓		620.58	644.54	Rot 30 CC 11	k	P.G.
140	Arb 22	3.7.00 / 3.8.00	9:10 / 9:05	30	30.7	✓		788.60	812.59	Rot 30 CC 8	PC	P.G.
141	PLA 22	3.7.00 / 3.8.00	10:00 / 10:05	30	30.5	✓		502.46	526.57	Rot 30 CC 2	PC	P.G.
142	Sch 22	3.7.00 / 3.8.00	10:30 / 10:45	30	30.4	✓		720.09	744.27	Rot 30 CC 5	O	P.G.
143	How 22	3.7.00 / 3.8.00	11:30	30	33.4	✓		719.09	743.41	Rot 30 CC 1	O	P.G.
144	Riv 22	3.7.00 / 3.8.00	12:50 / 1:00	30	33.9	✓		644.54	688.61	Rot 30 CC 11	O	P.G.

AIR RESOURCES BOARD

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SAMPLE FIELD LOG SHEET

Project: BIC Ambient Air Monitoring
Project # : C99-108

SCH : Schelby School
PLA : Plainsburg School
HOW : Howard School

ARB : ARB in Fresno
RIV : Riverview School

Log #	Sample ID	Date On/Off	Time On/Off	Start Flow ( )( )	End Flow	Start Leak Check	End Leak Check	Start ETM Count	End ETM Count	Comments	Weather o=overcast pc=partly cloudy c=cloudy k=clear	Initials
145	Arb 23	3-8-00 / 3-9-00	9:05 / 9:10	30	32.5	✓	836.59	→	836.69	Ret 30 cc 8	o	P.G.
146	Arb 23 D	3-8-00 / 3-9-00	9:05 / 9:10	30	54.0	✓	836.59	→	836.69	Ret 30 cc 7	o	P.G.
147	PLA 23	3-8-00 / 3-9-00	10:05 / 10:10	30	31.0	✓	526.57	→	550.60	Ret 30 cc 7	o	P.G.
148	PLA 23	3-8-00 / 3-9-00	10:05 / 10:10	30	48.0	✓	526.57	→	550.60	Ret 30 cc 3	PC	P.G.
149	Sch 23	3-8-00 / 3-9-00	10:45 / 10:40	30	31.1	✓	744.27	→	768.23	Ret 30 cc 5	PC	P.G.
150	Sch 23 D	3-8-00 / 3-9-00	10:45 / 10:40	30	31.5	✓	744.27	→	768.23	Ret 30 cc 4	PC	P.G.
151	How 23	3-8-00 / 3-9-00	11:55 / 11:50	30	30.0	✓	743.41	→	767.43	Ret 30 cc 12	PC	P.G.
152	How 23 D	3-8-00 / 3-9-00	11:55 / 11:50	30	24.0	✓	743.41	→	767.43	Ret 30 cc 1	PC	P.G.
153	Riv 23	3-8-00 / 3-9-00	1:00 / 1:10	30	27.2	✓	1966.69	→	677.99	Ret 30 cc 11	O	P.G.
154	Riv 23 D	3-8-00 / 3-9-00	1:00 / 1:10	30	28.0	✓	1966.69	→	677.99	Ret 30 cc 10	O	P.G.
155	Arb 24	3-9-00 / 3-10-00	9:15 / 9:10	30	32.5	✓	860.66	→	860.66	Ret 30 cc 3	k	P.G.
156	PLA 24	3-9-00 / 3-10-00	10:05 / 10:10	30	30	✓	550.60	574.57	Ret 30 cc 2	PC	P.G.
157	Sch 24	3-9-00 / 3-10-00	10:40 / 10:40	30	31.4	✓	768.23	792.19	Ret 30 cc 5	PC	P.G.
158	How 24	3-9-00 / 3-10-00	11:55 / 11:50	30	28.4	✓	767.43	791.25	Ret 30 cc 12	PC	P.G.
159	Riv 24	3-9-00 / 3-10-00	1:10 / 12:35	36	30.5	✓	677.99	702.69	Ret 30 cc 11	PC	P.G.
160	Blank	3-9-00 / 3-10-00	1:10	—	—	—	—	—	—	—	PC	P.G.

AIR RESOURCES BOARD

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APPENDIX VIII

BENOMYL APPLICATION FIELD LOG SHEETS

SAMPLE FIELD LOG SHEET

Project: Benomyl/Carbendazim Application Air Monitoring
Project # : C99-108

Log #	Sample ID	Date On/Off	Time On/Off	Start Flow (LPM)	End Flow (LPM)	Start Leak Check	End Leak Check	Start ETM Count	End ETM Count	Comments	Weather (o=overcast, pc=partly, c=cloudy, k=clear)	Initials
1	BG1WC	2/24/00 1630 / 2/25/00 0730		2.50	2.50	✓	✓	61.0	76.0	Rotameter C6 Background	O	OK
2	BG2NC	2/24/00 1645 / 2/25/00 0745		2.50	2.54	✓	✓	190.5	205.4	C7 "	O	OK
3	BG3EC	2/24/00 1700 / 2/25/00 0755		2.50	2.60	✓	✓	74.4	89.2	C4 "	O	OK
4	BG4SC	2/24/00 1710 / 2/25/00 0805		2.50	2.66	✓	✓	110.4	125.4	C2 "	O	OK
5	FS1WC	2/24/00 1630 / 2/25/00 0730		2.50	2.54	✓	✓	97.3	112.3	2000 ng/ SPIKE C1	O	OK
6	FS2WC	2/24/00 1630 / 2/25/00 0730		2.50	2.52	✓	✓	94.7	111.6	2050 ng SPIKE 5-12	O	OK
7	FS3WC	2/24/00 1630 / 2/25/00 0730		2.50	2.46	✓	✓	108.7	123.6	2050 ng SPIKE C8	O	OK
8	FS4EC	2/24/00 1700 / 2/25/00 0755		2.50	2.62	✓	✓	116.3	131.2	C3	O	OK
9	FS5EC	2/24/00 1700 / 2/25/00 0755		2.50	2.52	✓	✓	105.7	120.6	C5	O	OK
10	FS6EC	2/24/00 1700 / 2/25/00 0755		2.50	2.55	✓	✓	N/A	N/A	NO ETM COUNTER C9	O	OK
11	CW1	2/25/00 0735 / 2/25/00 1730		2.50	2.50	✓	✓	112.3	121.7	C1 1ST APPLICATION START TIME: 0755	k/pc	OK
12	CN21	2/25/00 0745 / 2/25/00 1740		2.50	2.50	✓	✓	205.4	215.0	C7	"	"
13	CE1	2/25/00 0755 / 2/25/00 1750		2.50	2.21	✓	✓	89.2	99.2	C4	"	"
14	CED1	2/25/00 0755 / 2/25/00 1750		2.50	2.17	✓	✓	131.2	141.1	Duplicate C3	"	"
15	CS31	2/25/00 0820 / 2/25/00 1755		2.50	2.50	✓	✓	120.6	130.2	C5	"	"
16	CS11	2/25/00 0825 / 2/25/00 1805		2.50	2.52	✓	✓	123.6	133.4	C8	"	"
17	CN31	2/25/00 0830 / 2/25/00 1735		2.50	2.42	✓	✓	76.0	85.2	C6	"	"

AIR RESOURCES BOARD

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SAMPLE FIELD LOG SHEET

Project: Benomyl/Carbendazim Application Air Monitoring

Project #: C99-108

Log #	Sample ID	Date On/Off	Time On/Off	Start Flow (L/min)	End Flow (L/min)	Start Leak Check	End Leak Check	Start ETM Count	End ETM Count	Comments	Weather (o=overcast pc=partly c=cloudy k=clear)	Initials
18	CN11	2/25/00	0835 / 1745	2.50	2.50	✓	✓	111.6	121.3	5-12	k/pc	OY
19	CS21	2/25/00	0805 / 1800	2.50	1.67	✓	✓	125.4	136.2	C2 APPLICATION END TIME: 1730	"	OY
20	CS12	2/25/00	0825 / 1830	2.50	2.50	✓	✓	133.4	145.2	C8	c/pc	OY
21	CS22	2/26/00	0630 / 1835	2.50	2.53	✓	✓	135.2	147.1	C2	"	"
22	CS32	2/25/00	0635 / 1840	2.50	2.50	✓	✓	141.1	153.1	C3	"	"
23	CS42	2/25/00	0640 / 1845	2.50	2.50	✓	✓	94.2	111.1	C4	"	"
24	CN12	2/25/00	0645 / 1850	2.50	2.50	✓	✓	121.3	133.2	5-12	"	"
25	CN22	2/25/00	0650 / 1850	2.50	2.94	✓	✓	121.7	133.9	C1	"	"
26	CN2D2	2/26/00	0650 / 1855	2.50	2.50	✓	✓	130.2	142.2	C5	"	"
27	CN32	2/25/00	0655 / 1900	2.50	2.50	✓	✓	215.0	227.0	C7 Duplicate	"	"
28	CN42	2/25/00	0700 / 1900	2.50	2.37	✓	✓	85.2	97.3	C6	"	"
29	CS13	2/26/00	0625 / 1030	2.50	2.50	✓	✓	147.1	151.3	APPLICATION START TIME: 0700	"	"
30	CS23	2/26/00	1035 /	2.50	2.46	✓	✓	145.2	146.4	2nd APPLICATION	q/pc	OY
31	CS33	2/26/00	0635 / 1040	2.50	2.48	✓	✓	153.1	157.2		"	"
32	CS43	2/26/00	0640 / 1045	2.50	2.49	✓	✓	111.1	115.3		"	"
33	CN13	2/26/00	0645 / 1050	2.50	2.50	✓	✓	133.2	137.4		"	"
34	CN23	2/26/00	0650 / 1055	2.50	2.50	✓	✓	133.9	138.0	C1	"	"

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SAMPLE FIELD LOG SHEET

Project: Benomyl/Carbendazim Application Air Monitoring
Project #: C99-108

Log #	Sample ID	Date On/Off	Time On/Off	Start Flow (L/min)	End Flow (L/min)	Start Leak Check	End Leak Check	Start ETM Count	End ETM Count	Comments	Weather o=overcast pc=partly cloudy c=cloudy k=clear	Initials
35	CN2D3	2/26/00	0650 / 1055	2.50	2.48	✓	✓	142.2	146.3	C5	c/pc	ok
36	CN33	2/26/00	0655 / 1100	2.50	2.50	✓	✓	227.0	231.1			ok
37	CN43	2/26/00	0700 / 1105	2.50	2.45	✓	✓	97.3	101.4	C6 APPLICATION END TIME: 1030	pc	ok
38	CS14	2/26/00	1030	2.50	2.50	✓	✓	144.4	150.3		"	"
39	CS24	2/26/00	1035	2.50	2.48	✓	✓	151.3	152.2		"	"
40	CS34	2/26/00	1040	2.50	2.55	✓	✓	157.2	158.1		"	"
41	CS44	2/26/00	1045	2.50	2.50	✓	✓	115.3	116.2		"	"
42	CN14	2/26/00	1050	2.50	2.44	✓	✓	137.4	138.3		"	"
43	CN24	2/26/00	1055	2.50	2.48	✓	✓	138.0	138.9	C1	"	"
44	CN2D4	2/26/00	1055	2.50	2.47	✓	✓	146.3	147.2	C5	"	"
45	CN34	2/26/00	1100	2.50	2.50	✓	✓	231.1	232.0	C7	"	"
46	CN44	2/26/00	1205	2.50	2.56	✓	✓	101.4	102.3		"	"
47	CS15	2/1?/00	1330	2.50	2.46	✓	✓	150.3	152.3	with index battery "Biological battery" low	"	"
48	CS25	2/26/00	1335	2.50	2.50	✓	✓	152.2	151.2		"	"
49	CS35	2/26/00	1340	2.50	2.56	✓	✓	158.1	160.1		"	"
50	CS45	2/26/00	1345	2.50	2.42	✓	✓	116.2	118.2		"	"
51	CN15	2/26/00	1350	2.50	2.54	✓	✓	138.3	140.3		"	"

SAMPLE FIELD LOG SHEET

Project: Benomyl/Carbendazim Application Air Monitoring

Project # : C99-108

Log #	Sample ID	Date On/Off	Time On/Off	Start Flow (Lpm)	End Flow (Lpm)	Start Leak Check	End Leak Check	Start ETM Count	End ETM Count	Comments	Weather o=overcast pc=partly c=cloudy k=clear	Initials
69	CN17	2/26/00 2/27/00	1705 0755	2.50	2.50	✓	✓	143.5	158.4		pc	OKL
70	CN27	2/26/00 2/27/00	1710 0800	2.50	2.59	✓	✓	144.1	158.9	C1	''	''
71	CN2D7	2/26/00 2/27/00	1710 0800	2.50	2.50	✓	✓	152.5	167.3	C5	''	''
72	CN37	2/26/00 2/27/00	1715 0805	2.50	2.44	✓	✓	237.3	252.1		''	''
73	CN47	2/26/00 2/27/00	1720 0810	2.50	2.56	✓	✓	107.5	122.2		''	''
74	CS18	2/27/00 2/27/00	0735 1650	2.50	2.52	✓	✓	170.3	179.6		O	DKL
75	CS28	2/27/00 2/27/00	0740 1655	2.50	2.57	✓	✓	172.3	181.5		''	''
76	CS38	2/27/00 2/27/00	0745 1700	2.50	2.58	✓	✓	178.2	187.4	Cartridge fell to ground or was on ground	''	''
77	CS48	2/27/00 2/27/00	0750 1705	2.50	2.52	✓	✓	136.3	145.5		''	''
78	CN18	2/27/00 2/27/00	0755 1710	2.50	2.39	✓	✓	158.4	167.4	very slow pump,	''	''
79	CN28	2/27/00 2/27/00	0800 1715	2.50	2.51	✓	✓	158.9	168.1	C1	''	''
80	CN2D8	2/27/00 2/27/00	0800 1715	2.50	2.50	✓	✓	167.3	176.6	C5	''	''
81	CN38	2/27/00 2/27/00	0805 1720	2.50	2.44	✓	✓	252.1	261.3		''	''
82	CN48	2/27/00 2/27/00	0810 1725	2.50	2.54	✓	✓	122.2	131.5		''	''
83	CS19	2/27/00 2/28/00	1650 0730	2.50	2.60	✓	✓	179.6	194.3		O	OKL
84	CS29	2/27/00 2/28/00	1655 0735	2.50	2.48	✓	✓	181.5	196.2		''	''
85	CS39	2/27/00 2/28/00	1700 0740	2.50	2.50	✓	✓	187.4	202.1		''	''

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AIR RESOURCES BOARD

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SAMPLE FIELD LOG SHEET

Project: Benomyl/Carbendazim Application Air Monitoring

Project #: C99-108

Log #	Sample ID	Date On/Off	Time On/Off	Start Flow (Lpm)	End Flow (Lpm)	Start Leak Check	End Leak Check	Start ETM Count	End ETM Count	Comments	Weather o=overcast pc=partly cloudy c=cloudy k=clear	Initials
86	CS49	2/27/00 2/28/00	1705 0745	2.50	2.51	✓	✓	145.5	160.2		O	ON
87	CN19	2/27/00 2/28/00	1710 0750	2.50	2.52	✓	✓	167.4	182.0		"	ON
88	CN24	2/27/00 2/28/00	1715 0755	2.50	2.61	✓	✓	168.1	182.8	C1	"	"
89	CN209	2/27/00 2/28/00	1720 0755	2.50	2.45	✓	✓	176.6	191.2	C5	"	"
90	CN39	2/28/00	1725 0800	2.50	2.50	✓	✓	261.3	275.9		"	"
91	CN49	2/28/00	1725 0805	2.50	2.48	✓	✓	131.5	146.2		"	"
92	CS110	2/28/00	0730 0735	2.50	2.50	✓	✓	191.3	218.4		O	ON
93	CS210	2/28/00	0735 0740	2.50	2.48	✓	✓	186.2	220.3		"	"
94	CS310	2/28/00	0740 0745	2.50	2.46	✓	✓	202.1	226.1		"	"
95	CS410	2/28/00	0745 0750	2.50	2.43	✓	✓	160.2	184.2		"	"
96	CN110	2/28/00	0750 0755	2.50	2.54	✓	✓	182.0	206.1		"	"
97	CN210	2/28/00	0755 0800	2.50	2.50	✓	✓	182.8	206.8	C1	"	"
98	CN2010	2/28/00	0800 0800	2.50	2.50	✓	✓	191.2	215.2	C5	"	"
99	CN310	2/28/00	0805 0805	2.50	2.48	✓	✓	275.9	284.0		"	"
100	CN410	2/28/00	0810 0805	2.50	2.50	✓	✓	146.2	170.1		"	"
101	CFBLANK	2/29/00	0815 0816								"	"
102	CTBLANK	2/29/00	0815 0815								"	"

AIR RESOURCES BOARD

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APPENDIX IX

n-BUTYL ISOCYANATE APPLICATION FIELD LOG SHEETS

SAMPLE FIELD LOG SHEET
Project: BIC Application Air Monitoring
Project # : C99-108

Log #	Sample ID	Date On/Off	Time On/Off	Start Flow (cc/min)	End Flow (cc/min)	Start Leak Check	End Leak Check	Start ETM Count	End ETM Count	Comments	Weather o=overcast pc=partly c=cloudy k=clear	Initials
1	BG1W	2/24/00 1635 / 2/25/00 0735		30.0	30.6	✓	✓	61.0	74.0	Rotameter B6	O	OY
2	BG2N	2/24/00 1645 / 2/25/00 0745		30.0	30.2	✓	✓	190.5	205.4	B7	O	OY
3	BG3E	2/24/00 1700 / 2/25/00 0750		30.0	29.0	✓	✓	74.4	89.2	B4	O	OY
4	BG4S	2/24/00 1710 / 2/25/00 0805		30.0	29.6	✓	✓	110.4	125.4	B2	O	OY
5	FS1W	2/24/00 1635 / 2/25/00 0735		30.0	31.0	✓	✓	97.3	112.3	B1	O	OY
6	FS2W	2/24/00 1635 / 2/25/00 0735		30.0	30.0	✓	✓	96.7	111.6	30cc6	O	OY
7	FS3E	2/24/00 1700 / 2/25/00 0750		30.0	23.8	✓	✓	116.3	131.2	B3	O	OY
8	FS4E	2/24/00 1700 / 2/25/00 0750		30.0	26.7	✓	✓	105.7	120.6	B5	O	OY
9	BW1	2/25/00 0810 / 2/25/00 1730		30.0	27.6	✓	✓	112.3	121.7	B1 1ST APPLICATION START TIME: 0755	k/pc	OY
10	BN21	2/25/00 0810 / 2/25/00 1740		30.0	31.2	✓	✓	205.4	215.0	B7	''	''
11	BE1	2/25/00 0815 / 2/25/00 1750		30.0	23.5	✓	✓	89.2	99.2	B4 Sampler was sprayed at close proximity at row 32 Elect. NN	''	''
12	BS21	2/25/00 0805 / 2/25/00 1800		30.0	30.9	✓	✓	125.4	135.2	B2	''	''
13	BS31	2/25/00 0820 / 2/25/00 1755		30.0	30.7	✓	✓	120.6	130.2	B5	''	''
14	BS11	2/25/00 0825 / 2/25/00 1825		30.0	29.7	✓	✓	123.6	133.4	B8	''	''
15	BN31	2/25/00 0830 / 2/25/00 1735		30.0	26.5	✓	✓	74.0	85.2	B6	''	''
16	BN11	2/25/00 0835 / 2/25/00 1745		30.0	33.6	✓	✓	111.6	121.3	30cc6	''	''
17	BED1	2/25/00 0815 / 2/25/00 1750		30.0	30.0	✓	✓	131.2	141.1	B3 APPLICATION END TIME: 1730	''	''

AIR RESOURCES BOARD

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SAMPLE FIELD LOG SHEET

Project: BIC Application Air Monitoring

Project # : C99-108

Log #	Sample ID	Date On/Off	Time On/Off	Start Flow (cc/min)	End Flow (cc/min)	Start Leak Check	End Leak Check	Start ETM Count	End ETM Count	Comments	Weather o=overcast pc=partly c=cloudy k=clear	Initials
18	BS12	2/25/00 1825 / 2/26/00 0625		30.0	26.7	✓	✓	133.4	145.2	B8	pc	OK.
19	BS22	2/25/00 1830 / 2/26/00 0630		30.0	30.0	✓	✓	135.2	147.1	B2	''	''
20	BS32	2/25/00 1835 / 2/26/00 0635		30.0	30.0	✓	✓	141.1	153.1	B3	''	''
21	BS42	2/25/00 1840 / 2/26/00 0640		30.0	31.7	✓	✓	99.2	111.1	B4	''	''
22	BN12	2/25/00 1845 / 2/26/00 0645		30.0	29.7	✓	✓	121.3	133.2	30CC B6	''	''
23	BN22	2/25/00 1850 / 2/26/00 0650		30.0	27.1	✓	✓	121.7	133.9	B1	''	''
24	BN2D2	2/25/00 1850 / 2/26/00 0650		30.0	27.7	✓	✓	130.2	142.2	B5	''	''
25	BN32	2/25/00 1855 / 2/26/00 0655		30.0	30.0	✓	✓	215.0	227.0	B7	''	''
26	BN42	2/25/00 1900 / 2/26/00 0700		30.0	28.1	✓	✓	85.2	97.3	B6	''	''
27	BS13	2/26/00 0625 / 2/26/00 1030		30.0	30.0	✓	✓	145.2	149.4	B8 2ⁿᵈ APPLICATION START TIME: 0700	c/pc	OK.
28	BS23	2/26/00 0630 / 2/26/00 1035		30.0	29.2	✓	✓	147.1	151.3		''	''
29	BS33	2/26/00 0635 / 2/26/00 1040		30.0	29.1	✓	✓	153.1	157.2		''	''
30	BS43	2/26/00 0640 / 2/26/00 1045		30.0	31.2	✓	✓	111.1	115.3		''	''
31	BN13	2/26/00 0645 / 2/26/00 1050		30.0	28.2	✓	✓	133.2	137.4		''	''
32	BN23	2/26/00 0650 / 2/26/00 1055		30.0	29.1	✓	✓	133.9	138.0	B1	''	''
33	BN2D3	2/26/00 0650 / 2/26/00 1055		30.0	30.0	✓	✓	142.2	146.3	B5	''	''
34	BN33	2/26/00 0655 / 2/26/00 1100		30.0	28.3	✓	✓	227.0	231.1	B7	''	''

SAMPLE FIELD LOG SHEET
Project: BIC Application Air Monitoring
Project # : C99-108

Log #	Sample ID	Date On/Off	Time On/Off	Start Flow (cc/min)	End Flow (cc/min)	Start Leak Check	End Leak Check	Start ETM Count	End ETM Count		Comments	Weather o=overcast pc=partly c=cloudy k=clear	Initials
35	BN43	2/26/00 / 2/26/00	0700 / 1105	30.0	30.0	✓	✓	97.3	101.4	B6	APPLICATION END TIME: 1030	c/pc	ORf.
36	BS14	2/26/00 / 2/26/00	1030 / 1130	30.0	30.0	✓	✓	149.4	150.3	38		pc	ORf
37	BS24	2/26/00 / 2/26/00	1035 / 1135	30.0	29.3	✓	✓	151.3	152.2			"	"
38	BS34	2/26/00 / 2/26/00	1040 / 1140	30.0	28.4	✓	✓	157.2	158.1			"	"
39	BS44	2/26/00 / 2/26/00	1045 / 1145	30.0	31.3	✓	✓	115.3	116.2			"	"
40	BN14	2/26/00 / 2/26/00	1050 / 1150	30.0	29.2	✓	✓	137.4	138.3			"	"
41	BN24	2/26/00 / 2/26/00	1055 / 1155	30.0	30.0	✓	✓	138.0	138.9	B1		"	"
42	BN2D4	2/26/00 / 2/26/00	1055 / 1155	30.0	30.0	✓	✓	146.3	147.2	B5		"	"
43	BN34	2/26/00 / 2/26/00	1100 / 1200	30.0	29.7	✓	✓	231.1	232.0			"	"
44	BN44	2/26/00 / 2/26/00	1105 / 1205	30.0	30.0	✓	✓	101.4	102.3	B6	Battery very low, pump not pumping correctly.	"	"
45	BS15	2/26/00 / 2/26/00	1130 / 1330	30.0	30.0	✓	✓	150.3	152.3			pc	ORf.
46	BS25	2/26/00 / 2/26/00	1135 / 1335	30.0	29.2	✓	✓	152.2	154.2			"	"
47	BS35	2/26/00 / 2/26/00	1140 / 1340	30.0	30.8	✓	✓	158.1	160.1			"	"
48	BS45	2/26/00 / 2/26/00	1145 / 1345	30.0	31.2	✓	✓	116.2	118.2			"	"
49	BN15	2/26/00 / 2/26/00	1150 / 1350	30.0	30.0	✓	✓	138.3	140.3			"	"
50	BN25	2/26/00 / 2/26/00	1155 / 1355	30.0	28.1	✓	✓	138.9	140.9	B1		"	"
51	BN2D5	2/26/00 / 2/26/00	1155 / 1355	30.0	28.6	✓	✓	147.2	149.3	B5		"	"

AIR RESOURCES BOARD

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SAMPLE FIELD LOG SHEET

Project: BIC Application Air Monitoring

Project #: C99-108

Log #	Sample ID	Date On/Off	Time On/Off	Start Flow (cc/min)	End Flow (cc/min)	Start Leak Check	End Leak Check	Start ETM Count	End ETM Count	Comments	Weather o=overcast pc=partly c=cloudy k=clear	Initials
52	BN35	2/26/00 2/26/00	1200 1400	30.0	29.6	✓	✓	232.0	234.0		pc	off
53	BN45	2/26/00 2/26/00	1205 1405	30.0	30.0	✓	✓	102.3	104.2		''	''
54	BS16	2/26/00 2/26/00	1330 1645	30.0	30.0	✓	✓	152.3	155.6	pc	OR
55	BS26	2/26/00 2/26/00	1335 1650	30.0	30.5	✓	✓	151.2	157.4		=	=
56	BS36	2/26/00 2/26/00	1340 1655	30.0	30.4	✓	✓	160.1	163.4		=	=
57	BS46	2/26/00 2/26/00	1345 1700	30.0	30.6	✓	✓	118.2	121.4		=	=
58	BN16	2/26/00 2/26/00	1350 1705	30.0	32.4	✓	✓	140.3	143.5		=	=
59	BN26	2/26/00 2/26/00	1355 1710	30.0	22.5	✓	✓	140.9	144.1	B1	=	=
60	BN36	2/26/00 2/26/00	1355 1710	30.0	30.2	✓	✓	149.3	152.5	135	=	=
61	BN46	2/26/00 2/26/00	1400 1715	30.0	30.0	✓	✓	234.0	237.3		=	=
62	BN16	2/26/00 2/26/00	1405 1720	30.0	28.5	✓	✓	104.2	107.5		=	=
63	BS17	2/26/00 2/27/00	1645 0735	30.0	21.2	✓	✓	155.6	170.3		pc	off
64	BS27	2/27/00 2/27/00	0740 1650	30.0	32.8	✓	✓	157.4	172.3		=	=
65	BS37	2/26/00 2/27/00	1655 0745	30.0	29.5	✓	✓	163.4	178.2		=	=
66	BS47	2/27/00 2/27/00	0750 1700	30.0	21.2	✓	✓	121.4	126.3		=	=
67	BN17	2/27/00 2/27/00	0755 1705	30.0	30.0	✓	✓	143.5	158.4		=	=
68	BN27	2/26/00 2/27/00	0800 1710	30.0	30.2	✓	✓	141.1	158.9 131		=	=

SAMPLE FIELD LOG SHEET

Project: BIC Application Air Monitoring

Project # : C99-108

Log #	Sample ID	Date On/Off	Time On/Off	Start Flow (cc/min)	End Flow (cc/min)	Start Leak Check	End Leak Check	Start ETM Count	End ETM Count	Comments	Weather o=overcast pc=partly cloudy c=cloudy k=clear	Initials
69	BN2D7	2/26/00 2/27/00	1710 0800	30.0	23.6	✓	✓	152.5	167.3 35		~	DN
70	BN37	2/26/00 2/27/00	1715 0805	30.0	30.0	✓	✓	237.3	252.1		"	"
71	BN417	2/26/00 2/27/00	1720 0810	30.0	29.8	✓	✓	107.5	122.2		"	"
72	BS18	2/27/00 2/27/00	1650 0735	30.0	30.8	✓	✓	170.3	171.6		O	DN
73	BS28	2/27/00 2/27/00	1655 0740	30.0	30.0	✓	✓	172.3	181.5		"	"
74	BS38	2/27/00 2/27/00	1700 0745	30.0	30.2	✓	✓	178.2	187.4		"	"
75	BS48	2/27/00 2/27/00	1705 0730	30.0	28.5	✓	✓	136.3/145.5			"	"
76	BN18	2/27/00 2/27/00	1710 0755	30.0	29.5	✓	✓	158.4	167.4	Almost no battery juice, very slow pump	"	"
77	BN28	2/27/00 2/27/00	1715 0800	30.0	30.6	✓	✓	158.9	168.1 B1		"	"
78	BN2D8	2/27/00 2/27/00	1715 0820	30.0	31.5	✓	✓	167.3	176.6 B5		"	"
79	BN38	2/27/00 2/27/00	1720 0805	30.0	30.0	✓	✓	252.1	261.3		"	"
80	BN418	2/27/00 2/27/00	1725 0810	30.0	30.0	✓	✓	122.2	131.5		"	"
81	BS19	2/27/00 2/28/00	1650 0730	30.0	31.2	✓	✓	174.6	194.3		O	DN
82	BS29	2/27/00 2/28/00	1655 0735	30.0	29.6	✓	✓	181.5	196.2		"	"
83	BS39	2/28/00 2/28/00	1700 0740	30.0	30.8	✓	✓	187.4	202.1		"	"
84	BS49	2/27/00 2/28/00	1705 0745	30.0	31.2	✓	✓	145.5	160.2		"	"
85	BN19	2/28/00 2/28/00	1710 0750	30.0	30.0	✓	✓	167.4	182.0		"	"

SAMPLE FIELD LOG SHEET

Project: BIC Application Air Monitoring
Project #: C99-108

Log #	Sample ID	Date On/Off	Time On/Off	Start Flow (cc/min)	End Flow (cc/min)	Start Leak Check	End Leak Check	Start ETM Count	End ETM Count	Comments	Weather o=overcast pc=partly cloudy c=cloudy k=clear	Initials
86	3N29	2/27/00 2/28/00	1715 0755	300	30.4	✓	✓	168.1	182.8 B1		O	OBC
87	3N2D9	2/27/00 2/28/00	1715 0755	30.0	28.3	✓	✓	176.6 191.2 B5			"	"
88	3N39	2/27/00 2/28/00	1720 0800	30.0	29.6	✓	✓	261.3 275.9			"	"
89	3N49	2/27/00 2/28/00	1725 0805	30.0	30.0	✓	✓	131.5 146.2			"	"
90	3S5110	2/28/00 2/29/00	0730 0730	30.0	29.7	✓	✓	141.3 218.1			O	OBC
91	3S5210	2/28/00 2/29/00	0735 0735	30.0	28.7	✓	✓	146.2 220.3			"	"
92	3S5310	2/28/00 2/29/00	0740 0745	30.0	28.2	✓	✓	202.1 276.1			"	"
93	3S5410	2/28/00 2/29/00	0745 0745	30.0	30.4	✓	✓	160.2 181.2			"	"
94	3N110	2/28/00 2/29/00	0750 0755	30.0	28.7	✓	✓	182.0 206.1			"	"
95	3N210	2/28/00 2/29/00	0755 0800	30.0	29.7	✓	✓	182.8 206.8 B1			"	"
96	3N2D10	2/28/00 2/29/00	0800 0755	30.0	28.1	✓	✓	191.2 215.2 B5			"	"
97	3N310	2/28/00 2/29/00	0805 0805	30.0	29.2	✓	✓	275.9 289.0			"	"
98	3N410	2/28/00 2/29/00	0810 0810	30.0	24.9	✓	✓	146.2 170.1			"	"
99	B FBLANK	2/29/00 2/29/00	0815 0815								"	"
100	BT BLANK	2/29/00 2/29/00	0815 0815								"	"

APPENDIX X

BENOMYL AND n-BUTYL ISOCYANATE APPLICATION
METEOROLOGICAL DATA

BENOMYL APPLICATION METEOROLOGICAL DATA (15 min. averages)

Year	Date	Time	Wind Speed (mph)	Wind Dirction (Deg)	Temperature (F)	Relative Humidity (%)	Barometric Pressure (inHg)
2000	2/24	16:15	1.9	271.1	59.3	41.8	29.78
2000	2/24	16:30	2.9	278.8	57.0	46.1	29.79
2000	2/24	16:45	2.5	151.0	54.8	49.7	29.79
2000	2/24	17:00	2.8	153.3	53.3	51.9	29.80
2000	2/24	17:15	2.9	145.6	52.5	55.2	29.79
2000	2/24	17:30	3.1	162.8	52.2	55.5	29.79
2000	2/24	17:45	3.3	154.8	51.8	57.4	29.79
2000	2/24	18:00	2.7	138.6	51.6	59.3	29.79
2000	2/24	18:15	3.2	143.5	51.4	60.3	29.78
2000	2/24	18:30	3.0	156.4	50.7	63.2	29.78
2000	2/24	18:45	2.7	144.8	50.2	65.2	29.79
2000	2/24	19:00	2.4	137.7	49.9	67.0	29.79
2000	2/24	19:15	2.7	145.6	49.7	68.7	29.79
2000	2/24	19:30	2.7	133.4	49.4	70.3	29.79
2000	2/24	19:45	2.7	137.7	49.2	71.7	29.78
2000	2/24	20:00	2.9	139.1	49.0	71.6	29.78
2000	2/24	20:15	2.6	135.7	48.8	71.9	29.78
2000	2/24	20:30	2.4	137.9	48.6	72.6	29.78
2000	2/24	20:45	2.3	145.7	48.4	74.4	29.77
2000	2/24	21:00	2.1	148.3	48.3	75.3	29.78
2000	2/24	21:15	2.0	156.8	48.1	76.4	29.78
2000	2/24	21:30	2.2	155.8	47.9	77.3	29.78
2000	2/24	21:45	2.2	156.4	47.7	78.3	29.78
2000	2/24	22:00	1.7	147.0	47.7	78.9	29.79
2000	2/24	22:15	1.4	120.6	47.7	78.5	29.80
2000	2/24	22:30	2.6	117.6	47.7	78.2	29.80
2000	2/24	22:45	2.3	107.8	47.6	78.7	29.81
2000	2/24	23:00	2.6	111.4	47.7	77.1	29.80
2000	2/24	23:15	1.5	118.8	47.8	76.2	29.82
2000	2/24	23:30	2.4	157.1	47.5	78.6	29.82
2000	2/24	23:45	2.3	155.7	47.1	81.2	29.81
2000	2/24	24:00:00	1.3	115.8	46.9	82.5	29.82
2000	2/25	0:15	2.6	160.3	46.8	83.0	29.81
2000	2/25	0:30	2.1	168.0	46.8	83.1	29.82
2000	2/25	0:45	2.2	159.3	46.8	82.5	29.81
2000	2/25	1:00	2.2	154.4	46.7	83.5	29.82
2000	2/25	1:15	2.6	143.3	46.6	84.3	29.82
2000	2/25	1:30	1.8	93.2	46.6	84.2	29.82
2000	2/25	1:45	1.5	45.2	46.5	84.7	29.83
2000	2/25	2:00	1.9	86.0	46.3	85.0	29.83
2000	2/25	2:15	1.4	127.3	46.4	82.3	29.83
2000	2/25	2:30	1.9	138.0	46.4	82.2	29.83
2000	2/25	2:45	2.9	123.9	46.2	82.3	29.82
2000	2/25	3:00	2.9	118.3	46.1	80.8	29.81
2000	2/25	3:15	3.0	125.9	46.1	79.8	29.81
2000	2/25	3:30	3.3	142.2	45.6	80.3	29.81
2000	2/25	3:45	2.7	144.1	45.4	80.7	29.81
2000	2/25	4:00	2.1	117.0	45.3	81.1	29.81
2000	2/25	4:15	2.5	116.9	45.4	80.6	29.81
2000	2/25	4:30	2.8	119.7	45.5	79.5	29.81
2000	2/25	4:45	3.2	103.8	44.8	80.6	29.81

BENOMYL APPLICATION METEOROLOGICAL DATA (15 min. averages)

Year	Date	Time	Wind Speed (mph)	Wind Dirction (Deg)	Temperature (F)	Relative Humidity (%)	Barometric Pressure (inHg)
2000	2/25	5:00	2.5	93.9	44.6	79.3	29.81
2000	2/25	5:15	2.0	72.0	43.2	83.4	29.81
2000	2/25	5:30	2.7	84.6	42.6	84.8	29.81
2000	2/25	5:45	3.0	92.5	42.6	85.0	29.81
2000	2/25	6:00	2.3	93.9	42.6	84.3	29.81
2000	2/25	6:15	2.2	91.4	42.3	84.6	29.81
2000	2/25	6:30	1.7	92.6	42.2	84.0	29.82
2000	2/25	6:45	1.8	105.1	41.8	84.4	29.82
2000	2/25	7:00	1.7	66.4	41.4	84.7	29.82
2000	2/25	7:15	1.4	62.6	40.8	87.0	29.82
2000	2/25	7:30	2.4	74.9	40.3	87.2	29.82
2000	2/25	7:45	2.4	83.1	40.4	87.3	29.83
2000	2/25	8:00	2.1	80.5	40.7	87.0	29.83
2000	2/25	8:15	2.4	70.6	41.1	86.7	29.85
2000	2/25	8:30	2.7	74.9	42.2	85.9	29.85
2000	2/25	8:45	2.7	88.2	43.4	84.1	29.87
2000	2/25	9:00	3.0	87.9	44.5	82.0	29.87
2000	2/25	9:15	3.0	96.9	45.4	80.6	29.88
2000	2/25	9:30	2.7	99.0	46.7	77.6	29.89
2000	2/25	9:45	3.2	100.9	48.1	74.2	29.90
2000	2/25	10:00	4.4	99.1	49.0	70.6	29.91
2000	2/25	10:15	4.6	97.7	49.7	68.7	29.92
2000	2/25	10:30	3.8	108.9	50.4	67.8	29.94
2000	2/25	10:45	4.4	114.3	50.9	66.7	29.95
2000	2/25	11:00	4.9	135.8	51.5	64.8	29.96
2000	2/25	11:15	4.5	133.2	52.1	63.1	29.97
2000	2/25	11:30	5.2	110.7	52.8	60.7	29.97
2000	2/25	11:45	4.8	113.6	53.8	58.3	29.97
2000	2/25	12:00	5.5	130.4	53.8	55.8	29.98
2000	2/25	12:15	5.3	133.5	54.2	56.5	29.98
2000	2/25	12:30	5.6	160.8	54.2	56.7	29.99
2000	2/25	12:45	4.3	129.2	54.4	56.8	29.99
2000	2/25	13:00	4.5	150.6	55.3	57.5	29.99
2000	2/25	13:15	4.8	180.4	55.2	58.0	29.99
2000	2/25	13:30	3.8	102.7	55.1	57.5	29.99
2000	2/25	13:45	3.9	141.3	55.7	56.9	29.98
2000	2/25	14:00	3.6	181.2	55.4	57.5	29.97
2000	2/25	14:15	3.5	177.8	55.6	57.7	29.97
2000	2/25	14:30	4.1	223.2	55.7	57.6	29.98
2000	2/25	14:45	4.1	189.3	56.2	57.4	29.98
2000	2/25	15:00	3.6	181.6	56.2	58.0	29.97
2000	2/25	15:15	2.6	191.8	56.4	57.6	29.97
2000	2/25	15:30	2.9	187.2	56.6	57.3	29.98
2000	2/25	15:45	2.9	215.2	56.4	57.2	29.98
2000	2/25	16:00	2.6	150.6	57.0	56.9	29.98
2000	2/25	16:15	3.2	182.1	57.0	56.3	29.98
2000	2/25	16:30	2.7	175.3	57.1	56.0	29.98
2000	2/25	16:45	2.5	166.0	57.5	57.1	29.98
2000	2/25	17:00	3.6	179.5	57.5	56.6	29.98
2000	2/25	17:15	2.4	212.8	57.4	57.2	29.98
2000	2/25	17:30	3.2	182.4	57.7	57.0	29.98

BENOMYL APPLICATION METEOROLOGICAL DATA (15 min. averages)

Year	Date	Time	Wind Speed (mph)	Wind Dirction (Deg)	Temperature (F)	Relative Humidity (%)	Barometric Pressure (inHg)
2000	2/25	17:45	3.1	183.6	57.6	56.8	29.98
2000	2/25	18:00	2.8	186.5	57.2	57.4	29.97
2000	2/25	18:15	2.2	203.1	56.6	59.6	29.97
2000	2/25	18:30	1.5	179.3	56.2	63.5	29.97
2000	2/25	18:45	2.2	166.7	55.7	65.3	29.96
2000	2/25	19:00	2.7	179.6	55.4	66.3	29.96
2000	2/25	19:15	2.6	182.4	54.6	69.5	29.95
2000	2/25	19:30	2.5	172.1	54.2	71.4	29.94
2000	2/25	19:45	2.0	190.2	53.5	73.1	29.94
2000	2/25	20:00	1.4	182.5	52.8	75.6	29.94
2000	2/25	20:15	2.2	159.0	53.0	73.2	29.93
2000	2/25	20:30	0.9	186.9	52.6	75.2	29.94
2000	2/25	20:45	1.6	172.4	52.4	75.9	29.94
2000	2/25	21:00	2.2	160.4	52.4	76.3	29.93
2000	2/25	21:15	2.9	128.9	52.4	75.5	29.92
2000	2/25	21:30	3.0	124.0	52.3	75.8	29.91
2000	2/25	21:45	2.8	120.8	52.3	74.9	29.92
2000	2/25	22:00	1.7	86.1	52.3	74.7	29.94
2000	2/25	22:15	0.7	343.0	52.0	75.6	29.95
2000	2/25	22:30	1.2	22.1	51.9	76.5	29.96
2000	2/25	22:45	1.4	26.3	51.5	78.4	29.96
2000	2/25	23:00	1.0	45.1	51.5	77.1	29.96
2000	2/25	23:15	2.5	60.9	51.1	79.0	29.96
2000	2/25	23:30	2.4	93.3	50.8	80.1	29.96
2000	2/25	23:45	3.3	91.7	50.9	79.8	29.96
2000	2/25	24:00:00	3.4	100.5	51.5	77.3	29.95
2000	2/26	0:15	2.9	96.8	51.5	77.1	29.95
2000	2/26	0:30	3.0	86.7	51.0	79.2	29.95
2000	2/26	0:45	3.3	94.3	51.2	78.9	29.95
2000	2/26	1:00	3.0	91.1	51.3	78.0	29.95
2000	2/26	1:15	2.6	84.6	51.2	78.2	29.96
2000	2/26	1:30	2.7	85.5	51.0	79.0	29.95
2000	2/26	1:45	2.8	93.4	51.0	78.7	29.95
2000	2/26	2:00	2.9	94.7	51.4	77.3	29.95
2000	2/26	2:15	3.6	103.4	51.8	75.9	29.94
2000	2/26	2:30	3.5	108.9	51.9	75.6	29.94
2000	2/26	2:45	3.6	122.4	51.8	75.4	29.93
2000	2/26	3:00	3.3	128.1	51.5	75.7	29.93
2000	2/26	3:15	2.7	123.5	51.4	75.9	29.92
2000	2/26	3:30	2.9	128.8	51.5	75.7	29.92
2000	2/26	3:45	3.3	138.6	51.2	76.8	29.91
2000	2/26	4:00	3.5	142.5	50.7	78.3	29.91
2000	2/26	4:15	2.9	147.1	50.3	79.5	29.91
2000	2/26	4:30	3.1	151.9	49.9	81.1	29.90
2000	2/26	4:45	3.5	143.8	49.8	81.5	29.90
2000	2/26	5:00	3.1	137.0	49.7	81.9	29.90
2000	2/26	5:15	2.9	135.0	49.4	81.6	29.90
2000	2/26	5:30	2.9	127.6	49.2	81.3	29.90
2000	2/26	5:45	3.2	125.1	49.3	82.0	29.90
2000	2/26	6:00	2.3	116.5	49.2	82.9	29.90
2000	2/26	6:15	2.4	107.9	49.0	83.4	29.90

BENOMYL APPLICATION METEOROLOGICAL DATA (15 min. averages)

Year	Date	Time	Wind Speed (mph)	Wind Dirction (Deg)	Temperature (F)	Relative Humidity (%)	Barometric Pressure (inHg)
2000	2/26	6:30	3.1	115.0	48.9	82.6	29.90
2000	2/26	6:45	3.0	123.0	48.8	81.8	29.90
2000	2/26	7:00	3.7	117.8	48.7	84.5	29.90
2000	2/26	7:15	3.0	112.2	48.8	84.7	29.90
2000	2/26	7:30	3.1	104.9	48.7	85.0	29.90
2000	2/26	7:45	3.4	107.9	48.5	85.6	29.90
2000	2/26	8:00	3.5	111.8	48.5	85.9	29.90
2000	2/26	8:15	3.9	116.8	48.7	85.9	29.90
2000	2/26	8:30	4.0	116.8	49.4	85.1	29.91
2000	2/26	8:45	4.0	105.8	49.9	83.6	29.91
2000	2/26	9:00	4.4	112.7	49.9	83.1	29.92
2000	2/26	9:15	4.7	112.2	50.4	82.5	29.93
2000	2/26	9:30	4.2	111.1	50.8	82.2	29.93
2000	2/26	9:45	4.8	110.2	51.9	80.4	29.93
2000	2/26	10:00	5.4	115.8	52.9	78.6	29.94
2000	2/26	10:15	6.0	120.8	54.2	76.5	29.94
2000	2/26	10:30	5.8	123.9	55.0	75.4	29.94
2000	2/26	10:45	5.9	120.6	55.7	74.2	29.95
2000	2/26	11:00	7.1	125.5	56.1	73.7	29.95
2000	2/26	11:15	6.3	124.7	56.8	73.1	29.96
2000	2/26	11:30	7.1	129.0	57.9	70.7	29.96
2000	2/26	11:45	7.0	124.6	58.5	69.5	29.97
2000	2/26	12:00	7.8	127.9	59.3	65.7	29.97
2000	2/26	12:15	7.1	136.0	60.0	65.8	29.97
2000	2/26	12:30	7.2	124.5	60.3	65.8	29.97
2000	2/26	12:45	8.6	138.4	61.1	61.8	29.97
2000	2/26	13:00	9.2	145.3	61.1	62.1	29.96
2000	2/26	13:15	9.2	139.7	61.6	61.9	29.96
2000	2/26	13:30	9.1	136.8	61.9	60.9	29.95
2000	2/26	13:45	9.0	139.8	62.3	58.7	29.94
2000	2/26	14:00	7.7	137.8	62.4	57.4	29.94
2000	2/26	14:15	7.3	139.0	63.0	59.7	29.93
2000	2/26	14:30	8.2	130.2	63.1	60.4	29.92
2000	2/26	14:45	8.7	147.6	63.4	59.4	29.91
2000	2/26	15:00	7.7	138.0	64.3	58.8	29.91
2000	2/26	15:15	8.3	145.8	65.1	56.5	29.90
2000	2/26	15:30	7.9	151.7	65.2	54.1	29.90
2000	2/26	15:45	8.1	156.9	65.5	53.0	29.90
2000	2/26	16:00	8.1	140.3	65.6	56.6	29.89
2000	2/26	16:15	8.4	144.9	65.3	57.1	29.88
2000	2/26	16:30	7.9	139.0	65.4	57.4	29.88
2000	2/26	16:45	8.1	133.3	65.1	58.0	29.87
2000	2/26	17:00	8.1	133.5	65.0	57.7	29.86
2000	2/26	17:15	8.8	138.8	64.7	57.1	29.86
2000	2/26	17:30	7.9	142.1	64.3	56.5	29.85
2000	2/26	17:45	6.2	149.0	64.1	58.9	29.85
2000	2/26	18:00	6.6	148.4	63.6	58.8	29.84
2000	2/26	18:15	5.2	157.1	62.9	61.4	29.84
2000	2/26	18:30	4.7	144.3	61.8	63.5	29.83
2000	2/26	18:45	5.1	141.8	60.7	67.4	29.82
2000	2/26	19:00	6.4	138.2	60.0	68.9	29.80

BENOMYL APPLICATION METEOROLOGICAL DATA (15 min. averages)

Year	Date	Time	Wind Speed (mph)	Wind Dirction (Deg)	Temperature (F)	Relative Humidity (%)	Barometric Pressure (inHg)
2000	2/26	19:15	6.6	134.0	59.6	69.5	29.79
2000	2/26	19:30	6.3	136.8	58.8	71.7	29.78
2000	2/26	19:45	5.4	133.1	58.2	71.8	29.77
2000	2/26	20:00	4.6	146.3	57.8	72.6	29.77
2000	2/26	20:15	3.3	151.3	57.1	75.3	29.77
2000	2/26	20:30	4.0	139.4	56.7	75.3	29.76
2000	2/26	20:45	5.4	127.4	57.0	75.1	29.76
2000	2/26	21:00	7.0	121.4	57.6	74.3	29.75
2000	2/26	21:15	8.1	122.3	57.8	72.9	29.73
2000	2/26	21:30	8.2	123.6	58.1	71.4	29.73
2000	2/26	21:45	7.6	127.9	58.1	70.7	29.74
2000	2/26	22:00	6.9	126.9	57.9	71.5	29.74
2000	2/26	22:15	7.4	127.6	57.6	72.6	29.74
2000	2/26	22:30	8.5	124.4	57.9	72.0	29.73
2000	2/26	22:45	5.3	132.9	58.0	71.9	29.73
2000	2/26	23:00	4.8	136.1	57.7	72.4	29.72
2000	2/26	23:15	5.5	135.9	57.6	72.9	29.72
2000	2/26	23:30	8.0	126.1	57.6	71.6	29.71
2000	2/26	23:45	8.2	131.0	57.7	70.7	29.70
2000	2/26	24:00:00	7.1	130.7	57.6	70.8	29.71
2000	2/27	0:15	7.4	131.7	57.6	70.1	29.70
2000	2/27	0:30	8.5	129.9	57.3	72.1	29.70
2000	2/27	0:45	9.0	127.9	56.9	72.8	29.68
2000	2/27	1:00	11.0	134.1	56.8	72.0	29.67
2000	2/27	1:15	10.2	144.0	57.1	70.9	29.67
2000	2/27	1:30	9.0	148.3	56.9	70.4	29.67
2000	2/27	1:45	7.1	144.8	56.9	69.2	29.67
2000	2/27	2:00	6.1	153.6	57.1	67.1	29.67
2000	2/27	2:15	6.2	153.9	57.4	65.8	29.66
2000	2/27	2:30	14.5	182.4	59.0	53.1	29.65
2000	2/27	2:45	15.7	179.4	58.9	51.6	29.65
2000	2/27	3:00	14.7	178.2	58.1	53.8	29.64
2000	2/27	3:15	13.5	179.5	57.5	55.8	29.64
2000	2/27	3:30	14.4	183.5	57.1	59.4	29.64
2000	2/27	3:45	12.5	180.0	57.1	60.9	29.63
2000	2/27	4:00	11.9	181.3	56.8	61.3	29.63
2000	2/27	4:15	9.8	180.4	55.7	68.5	29.63
2000	2/27	4:30	8.5	198.2	54.8	74.6	29.64
2000	2/27	4:45	4.2	211.5	53.7	80.4	29.65
2000	2/27	5:00	3.6	169.0	53.2	83.7	29.64
2000	2/27	5:15	3.2	140.9	52.7	86.7	29.64
2000	2/27	5:30	3.4	150.1	52.5	87.2	29.64
2000	2/27	5:45	2.8	147.2	52.4	88.3	29.64
2000	2/27	6:00	3.6	163.5	52.4	89.5	29.64
2000	2/27	6:15	3.4	163.7	52.4	90.0	29.64
2000	2/27	6:30	3.1	159.3	52.3	90.5	29.64
2000	2/27	6:45	3.6	130.1	52.2	89.7	29.64
2000	2/27	7:00	3.5	150.0	52.1	89.3	29.65
2000	2/27	7:15	3.7	150.2	52.0	88.9	29.65
2000	2/27	7:30	4.8	112.9	51.7	88.8	29.64
2000	2/27	7:45	6.1	111.7	51.8	90.1	29.63

BENOMYL APPLICATION METEOROLOGICAL DATA (15 min. averages)

Year	Date	Time	Wind Speed (mph)	Wind Dirction (Deg)	Temperature (F)	Relative Humidity (%)	Barometric Pressure (inHg)
2000	2/27	8:00	7.7	124.5	51.8	89.8	29.63
2000	2/27	8:15	9.3	116.9	51.7	89.8	29.60
2000	2/27	8:30	8.3	107.5	51.6	90.3	29.61
2000	2/27	8:45	8.1	121.8	51.6	90.1	29.61
2000	2/27	9:00	8.5	133.6	52.1	85.3	29.62
2000	2/27	9:15	9.5	141.2	52.1	81.2	29.63
2000	2/27	9:30	8.8	146.0	51.8	79.1	29.62
2000	2/27	9:45	9.5	153.3	51.8	77.6	29.63
2000	2/27	10:00	10.0	145.3	52.2	78.5	29.64
2000	2/27	10:15	10.1	137.4	52.7	78.3	29.64
2000	2/27	10:30	9.1	138.3	53.3	78.9	29.64
2000	2/27	10:45	8.8	130.3	53.4	77.8	29.65
2000	2/27	11:00	9.4	135.6	54.0	76.1	29.66
2000	2/27	11:15	10.5	133.6	54.6	74.3	29.66
2000	2/27	11:30	10.6	131.0	55.7	73.2	29.67
2000	2/27	11:45	11.3	133.2	56.1	72.9	29.67
2000	2/27	12:00	11.1	132.5	55.7	73.6	29.68
2000	2/27	12:15	11.8	133.9	55.8	73.2	29.68
2000	2/27	12:30	9.9	128.8	56.7	72.3	29.68
2000	2/27	12:45	10.1	130.8	55.9	72.8	29.68
2000	2/27	13:00	9.1	119.9	56.1	73.8	29.67
2000	2/27	13:15	9.9	126.7	57.0	72.6	29.67
2000	2/27	13:30	9.3	132.8	57.0	71.7	29.66
2000	2/27	13:45	10.0	145.5	57.3	71.7	29.65
2000	2/27	14:00	10.4	136.8	56.6	75.9	29.64
2000	2/27	14:15	9.7	135.8	56.6	77.6	29.63
2000	2/27	14:30	10.8	135.2	57.1	74.0	29.61
2000	2/27	14:45	12.4	141.1	58.3	72.8	29.61
2000	2/27	15:00	10.7	131.7	57.7	74.4	29.60
2000	2/27	15:15	9.7	228.9	55.8	73.1	29.62
2000	2/27	15:30	5.5	297.0	51.7	79.0	29.63
2000	2/27	15:45	5.8	312.4	52.0	81.2	29.64
2000	2/27	16:00	5.8	328.4	52.1	81.4	29.64
2000	2/27	16:15	4.7	359.3	51.0	83.3	29.64
2000	2/27	16:30	3.4	333.6	50.3	85.4	29.65
2000	2/27	16:45	3.9	319.4	50.8	81.5	29.64
2000	2/27	17:00	2.1	154.8	50.7	83.0	29.65
2000	2/27	17:15	3.0	68.4	49.4	89.5	29.64
2000	2/27	17:30	3.9	62.2	49.4	89.7	29.64
2000	2/27	17:45	4.1	69.2	49.3	89.5	29.64
2000	2/27	18:00	4.1	73.0	48.7	89.2	29.64
2000	2/27	18:15	3.2	83.5	48.5	90.2	29.64
2000	2/27	18:30	3.1	91.4	48.1	90.3	29.64
2000	2/27	18:45	3.7	86.2	47.6	89.4	29.65
2000	2/27	19:00	3.0	83.5	47.2	90.3	29.66
2000	2/27	19:15	3.5	83.9	47.0	90.9	29.66
2000	2/27	19:30	3.3	90.4	46.7	89.7	29.67
2000	2/27	19:45	4.3	113.4	46.8	88.9	29.67
2000	2/27	20:00	3.2	72.9	46.8	88.1	29.68
2000	2/27	20:15	4.2	139.0	46.6	89.0	29.69
2000	2/27	20:30	4.8	162.4	46.8	88.6	29.69

BENOMYL APPLICATION METEOROLOGICAL DATA (15 min. averages)

Year	Date	Time	Wind Speed (mph)	Wind Dirction (Deg)	Temperature (F)	Relative Humidity (%)	Barometric Pressure (inHg)
2000	2/27	20:45	3.7	134.1	46.5	88.0	29.69
2000	2/27	21:00	2.6	92.3	46.3	88.8	29.70
2000	2/27	21:15	2.4	81.0	46.3	89.4	29.71
2000	2/27	21:30	2.0	83.1	46.4	88.9	29.71
2000	2/27	21:45	4.2	61.4	46.3	88.3	29.71
2000	2/27	22:00	2.1	90.5	46.4	87.9	29.72
2000	2/27	22:15	1.6	88.7	46.4	88.3	29.72
2000	2/27	22:30	2.0	104.2	46.4	89.4	29.73
2000	2/27	22:45	2.4	118.4	46.4	88.7	29.73
2000	2/27	23:00	2.3	129.6	46.3	88.6	29.74
2000	2/27	23:15	2.9	169.2	46.1	89.2	29.74
2000	2/27	23:30	3.3	160.1	45.6	90.6	29.73
2000	2/27	23:45	2.8	147.9	45.6	90.6	29.73
2000	2/27	24:00:00	2.5	159.5	45.8	91.1	29.74
2000	2/28	0:15	2.8	173.8	45.9	91.5	29.74
2000	2/28	0:30	3.8	190.5	46.0	91.3	29.74
2000	2/28	0:45	3.8	189.1	46.2	91.2	29.75
2000	2/28	1:00	2.9	177.1	46.2	91.0	29.75
2000	2/28	1:15	2.2	128.4	45.7	90.9	29.76
2000	2/28	1:30	2.6	160.6	45.6	90.1	29.76
2000	2/28	1:45	2.4	123.1	45.7	90.4	29.77
2000	2/28	2:00	2.5	137.3	45.6	90.6	29.77
2000	2/28	2:15	2.8	149.6	45.1	92.3	29.78
2000	2/28	2:30	2.4	144.1	44.8	93.0	29.77
2000	2/28	2:45	2.6	132.8	44.5	93.3	29.77
2000	2/28	3:00	2.7	150.8	44.2	93.4	29.77
2000	2/28	3:15	2.5	160.1	44.2	93.8	29.77
2000	2/28	3:30	2.9	133.2	44.0	94.7	29.76
2000	2/28	3:45	2.7	108.0	44.1	95.3	29.75
2000	2/28	4:00	1.7	121.7	43.8	94.7	29.76
2000	2/28	4:15	2.0	126.9	43.7	95.6	29.77
2000	2/28	4:30	2.4	135.4	43.8	96.0	29.77
2000	2/28	4:45	2.5	138.6	43.9	96.1	29.77
2000	2/28	5:00	2.1	130.0	44.1	96.2	29.77
2000	2/28	5:15	2.1	159.3	44.4	96.2	29.78
2000	2/28	5:30	3.0	155.7	44.6	96.1	29.78
2000	2/28	5:45	2.5	146.3	44.7	96.0	29.78
2000	2/28	6:00	1.5	206.5	44.9	95.3	29.79
2000	2/28	6:15	2.4	156.4	45.0	94.2	29.79
2000	2/28	6:30	2.7	144.1	44.6	94.1	29.79
2000	2/28	6:45	2.1	142.5	44.0	94.3	29.79
2000	2/28	7:00	2.2	143.9	43.8	94.0	29.79
2000	2/28	7:15	2.4	137.5	43.5	93.9	29.80
2000	2/28	7:30	2.4	138.9	43.6	92.8	29.80
2000	2/28	7:45	2.1	167.6	43.4	92.8	29.81
2000	2/28	8:00	2.0	179.1	43.6	93.0	29.81
2000	2/28	8:15	2.3	185.0	44.1	93.1	29.82
2000	2/28	8:30	2.3	165.5	44.8	94.5	29.82
2000	2/28	8:45	1.9	121.9	45.4	93.7	29.83
2000	2/28	9:00	2.7	93.3	46.1	94.2	29.84
2000	2/28	9:15	2.6	83.6	46.6	93.2	29.85

BENOMYL APPLICATION METEOROLOGICAL DATA (15 min. averages)

Year	Date	Time	Wind Speed (mph)	Wind Dirction (Deg)	Temperature (F)	Relative Humidity (%)	Barometric Pressure (inHg)
2000	2/28	9:30	3.4	104.9	47.3	90.9	29.86
2000	2/28	9:45	3.7	126.4	48.0	88.7	29.86
2000	2/28	10:00	3.6	140.6	48.7	86.9	29.87
2000	2/28	10:15	3.6	152.8	49.6	85.9	29.88
2000	2/28	10:30	3.6	160.8	50.2	83.6	29.90
2000	2/28	10:45	3.6	188.3	50.3	80.7	29.91
2000	2/28	11:00	3.0	213.6	50.9	78.1	29.91
2000	2/28	11:15	3.7	211.9	51.4	76.3	29.92
2000	2/28	11:30	3.6	260.9	51.6	76.4	29.93
2000	2/28	11:45	5.6	296.4	52.3	74.4	29.93
2000	2/28	12:00	5.1	304.5	52.7	72.8	29.93
2000	2/28	12:15	4.9	315.1	53.4	71.9	29.93
2000	2/28	12:30	5.5	333.5	54.6	69.9	29.93
2000	2/28	12:45	4.3	313.3	53.7	66.2	29.94
2000	2/28	13:00	6.2	332.6	54.5	65.3	29.94
2000	2/28	13:15	5.1	334.9	54.3	66.1	29.94
2000	2/28	13:30	4.8	321.2	54.7	62.9	29.93
2000	2/28	13:45	5.7	343.6	55.1	62.7	29.93
2000	2/28	14:00	6.1	357.3	55.0	61.3	29.92
2000	2/28	14:15	6.2	355.2	55.0	59.0	29.92
2000	2/28	14:30	5.2	358.7	55.1	58.5	29.91
2000	2/28	14:45	4.7	353.2	55.0	59.4	29.91
2000	2/28	15:00	4.0	342.2	55.1	60.9	29.91
2000	2/28	15:15	3.2	326.6	55.2	60.4	29.90
2000	2/28	15:30	2.3	341.0	55.4	57.7	29.89
2000	2/28	15:45	2.4	341.6	55.5	55.5	29.89
2000	2/28	16:00	3.2	312.2	56.0	56.7	29.89
2000	2/28	16:15	2.7	228.8	56.2	54.4	29.89
2000	2/28	16:30	2.5	240.8	56.5	54.8	29.89
2000	2/28	16:45	3.1	252.0	56.6	54.9	29.90
2000	2/28	17:00	3.4	198.4	56.6	54.9	29.90
2000	2/28	17:15	2.7	169.3	57.3	54.7	29.90
2000	2/28	17:30	3.7	225.2	56.6	54.9	29.90
2000	2/28	17:45	3.7	257.9	56.4	55.2	29.91
2000	2/28	18:00	3.9	275.7	56.1	56.0	29.93
2000	2/28	18:15	2.8	281.5	55.4	60.2	29.93
2000	2/28	18:30	2.2	275.5	55.2	60.3	29.93
2000	2/28	18:45	1.3	302.0	55.0	62.3	29.92
2000	2/28	19:00	1.4	311.7	54.3	65.2	29.91
2000	2/28	19:15	1.8	331.3	54.4	64.6	29.92
2000	2/28	19:30	2.4	31.7	53.9	66.5	29.92
2000	2/28	19:45	2.3	59.2	51.7	75.0	29.92
2000	2/28	20:00	2.0	63.5	51.0	77.8	29.91
2000	2/28	20:15	1.7	67.5	50.9	76.9	29.91
2000	2/28	20:30	0.6	69.7	50.0	80.7	29.91
2000	2/28	20:45	1.0	347.1	50.3	80.7	29.91
2000	2/28	21:00	1.5	195.9	49.8	82.5	29.91
2000	2/28	21:15	2.2	177.6	49.5	84.4	29.91
2000	2/28	21:30	2.3	142.2	50.3	81.1	29.90
2000	2/28	21:45	1.4	190.6	50.8	79.8	29.90
2000	2/28	22:00	1.2	195.9	50.9	79.8	29.90

BENOMYL APPLICATION METEOROLOGICAL DATA (15 min. averages)

Year	Date	Time	Wind Speed (mph)	Wind Dirction (Deg)	Temperature (F)	Relative Humidity (%)	Barometric Pressure (inHg)
2000	2/28	22:15	2.6	147.4	50.9	79.7	29.90
2000	2/28	22:30	2.5	143.8	50.0	82.1	29.90
2000	2/28	22:45	2.7	128.3	49.9	79.1	29.89
2000	2/28	23:00	2.4	117.5	49.5	78.7	29.89
2000	2/28	23:15	1.9	104.1	49.7	77.6	29.88
2000	2/28	23:30	1.4	93.8	49.6	76.7	29.88
2000	2/28	23:45	1.5	154.1	47.4	82.0	29.88
2000	2/28	24:00:00	1.6	152.0	48.0	81.0	29.88
2000	2/29	0:15	0.8	138.2	47.1	82.5	29.87
2000	2/29	0:30	1.0	88.9	47.2	82.6	29.87
2000	2/29	0:45	0.8	131.2	47.5	80.9	29.86
2000	2/29	1:00	2.0	123.7	48.0	80.0	29.86
2000	2/29	1:15	1.9	136.5	47.4	81.6	29.86
2000	2/29	1:30	2.7	113.4	47.3	82.3	29.85
2000	2/29	1:45	2.1	108.2	47.3	82.9	29.86
2000	2/29	2:00	1.5	121.6	47.4	82.7	29.86
2000	2/29	2:15	1.8	138.7	47.5	82.6	29.87
2000	2/29	2:30	2.0	133.7	47.5	82.9	29.87
2000	2/29	2:45	1.3	120.5	47.8	82.1	29.87
2000	2/29	3:00	0.9	115.2	47.1	83.8	29.87
2000	2/29	3:15	2.0	121.5	47.1	84.3	29.87
2000	2/29	3:30	1.9	137.5	47.2	84.9	29.87
2000	2/29	3:45	2.1	125.3	47.3	84.2	29.86
2000	2/29	4:00	2.3	105.9	47.5	83.9	29.86
2000	2/29	4:15	2.7	116.2	47.8	83.6	29.84
2000	2/29	4:30	1.9	109.2	48.1	83.2	29.84
2000	2/29	4:45	1.3	122.7	48.3	82.8	29.83
2000	2/29	5:00	2.1	78.8	47.8	84.8	29.83
2000	2/29	5:15	2.6	79.5	47.5	86.9	29.83
2000	2/29	5:30	2.6	88.2	47.3	88.4	29.83
2000	2/29	5:45	2.3	67.0	47.1	89.4	29.83
2000	2/29	6:00	2.3	77.2	46.9	90.9	29.83
2000	2/29	6:15	2.4	88.9	46.8	91.4	29.83
2000	2/29	6:30	2.1	56.7	46.8	91.4	29.83
2000	2/29	6:45	2.2	63.6	46.7	92.5	29.83
2000	2/29	7:00	2.6	77.8	46.7	92.5	29.83
2000	2/29	7:15	2.9	90.5	46.6	92.4	29.83
2000	2/29	7:30	2.7	104.7	46.8	92.0	29.83
2000	2/29	7:45	1.9	114.0	47.0	91.1	29.83
2000	2/29	8:00	3.4	114.0	47.0	91.3	29.82
2000	2/29	8:15	2.7	125.0	47.1	91.1	29.82
2000	2/29	8:30	3.5	125.7	47.3	90.4	29.82
2000	2/29	8:45	3.8	126.3	47.5	89.9	29.82
2000	2/29	9:00	5.1	122.1	47.6	89.8	29.81
2000	2/29	9:15	4.5	131.7	47.6	89.8	29.81
2000	2/29	9:30	5.3	133.2	48.2	89.3	29.80